ARTS AND CRAFTS

By the Same Author

NATURE IN RECREATION

Arts and Crafts

A PRACTICAL HANDBOOK

By MARGUERITE ICKIS

ILLUSTRATED

NEW YORK

A. S. BARNES AND COMPANY, INC.

PRINTED IN THE UNITED STATES OF AMERICA

Acknowledgments

Very often in the field of recreation and education I have felt the need of a manual of handicrafts which would give a number of simple basic techniques, and would serve as a reference book for beginners and for craft program directors. I have had the good fortune to be associated with a number of excellent craftsmen and have enlisted the services of several of them in preparing this book.

I wish to acknowledge with thanks the collaboration of the following: Reba Esh for the chapters on Printing and Bookbinding; Eugene C. Fitsch for his contribution on the Silk Screen; Albert F. Mainland for the chapters on Woodworking and Metal Craft; and Sylvia Block for those on Pottery and Puppetry.

MARGUERITE ICKIS

Contents

Foreword

Our hands have a deep urge to be busy in making something which we have chosen; if possible, something of beauty. Making things with our hands is one language of expression for most of us, and the craving for the beautiful is also nearly universal and deep down at the very core of our being.

The love of beauty lies close to religion. All through the centuries men have laboured bit by bit to build their cathedrals and in so doing have built themselves, have become what they were not before.

Marguerite Ickis, out of the wealth of her own experience of beauty, has put together in this book that which will help us all in our quest for beauty and our desire to create.

Slowly we learn—but surely—that our wealth in this world is not in that which we have bought, but in that which we have created, in what we have really and truly made our own. This book will help to increase the wealth of the world.

Howard Braucher

Starting a Craft Program

THE ATMOSPHERE of a well-ordered workshop is interesting and appealing to most people, particularly to children. One might justly paraphrase one of the mighty men of our day and say, "Show us the tools, and we shall be only too eager to set to work" There really is an artisan if not an artist in every one, and the writer has found that the ideal way to begin a craft program is to set up shop, as it were, and let the influence of tools and materials have its way with the prospective crafters

All you really need for a start is a fairly large room with good light, some work tables, chairs, and a few tools. You can buy enough tools for a program including a dozen different activities for less than ten dollars. You will find on the following pages a description of those necessary for a good beginning in craft work and some suggestions as to their arrangement.

If you are setting up a large program, with an ample budget, you will perhaps approach it more formally, draw up criteria, and have everything carefully planned beforehand. This is advisable in some circumstances—where there will be large groups and a number of teachers.

However, one likes to think of the craftsman as a lover of his work—an amateur in the true sense The atmosphere of a craft room should be one of inspiration, not compulsion.

A wise beginning is to have a number of short-term projects which require only scrap materials. With Children, particularly, this is good practise. It does not pay to spend much time on scrap work, but by experimenting with materials that would otherwise be of no account, you feel freer than with new things. You will soon discover which activity appeals most to the various members of your group and what each can do best. Then, later, you can decide what projects you will establish, and buy your materials accordingly. Everyone should be encouraged to try new skills, although given freedom of choice as to his major craft work.

It is more interesting to have a number of different things going forward at the same time than to have a whole group engaged in the same project.

Groups need not be too rigidly divided according to age. Aptitude and handiness do not follow arbitrarily according to years. In an experiment

conducted by the writer, it was found that where mothers and young children were working together, the children could often keep abreast and sometimes they exceeded their parents, and this gave great zest and stimulus to the work.

Immediately following are illustrations and descriptions of tools recommended for starting a craft program. Fig. 1 shows those that would be required for a group of sixteen. Scissors, modellers, and knives are what might be considered individual tools because one participant would need one continuously until a project is completed. Only eight of each kind are recom-

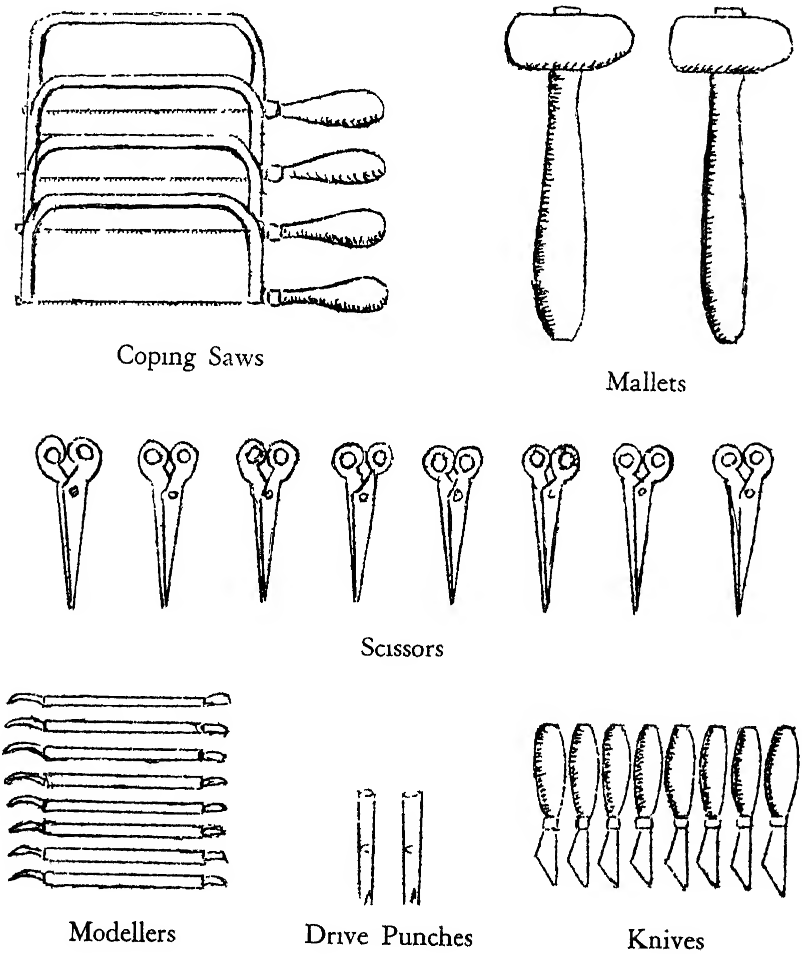


Fig. 1—Basic Tools for a Group of Sixteen in Simple Crafts

mended, because a teacher, with the assistance of an aide or an experienced student, can easily teach several crafts at one time. This is really more interesting and more desirable than to have only one activity going on at once.

Following is a list of crafts that could be carried on with these tools: paper work, elementary woodwork, whittling, aeroplane models, bookbinding, block printing, eraser printing, potato printing, simple weaving, puppetry, and mask making.

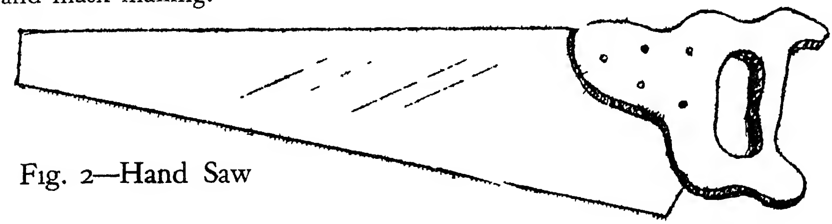


Fig. 2—Hand Saw

The most useful hand saw for a limited budget is the combination hand saw, which serves the purpose of a cross cut and rip saw. We recommend sizes 16″ to 18″, with 10 to 11 points to the inch.

A set of nest saws would be exceptionally useful as a substitute for the above. The set consists of three blades and one handle, the three blades being a panel saw 16″ long, a hack saw 12″ long, and a compass saw 12″ long. The compass saw can be used for cutting soft metals as well as wood. The handle is interchangeable with each blade. A set of nest saws can be purchased for less than $1.00 per set.

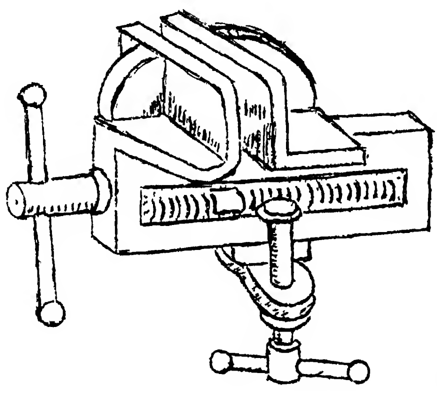


Fig. 3—Vise

One of the handiest vises on the market is the Stanley Wood Worker's Vise, #700. Since it can be clamped to the edge of a table or onto a carpenter's horse, it is a practical one for all woodworking purposes.

The jaws are machined parallel to grip the work firmly, either horizontally or vertically. A heavy machine cut screw supported on both ends insures rigidity and easy operation. The jaws are 4-3/8″ wide and open up to 4″.

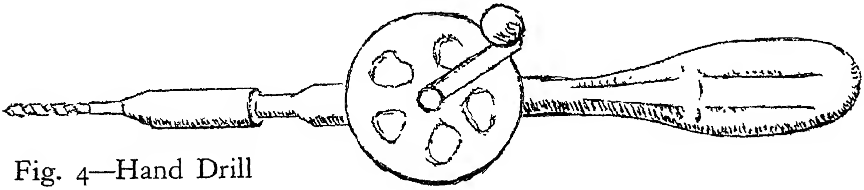


Fig. 4—Hand Drill

On a limited budget or with a minimum of space for the storing of tools, the hand drill often is preferable to the brace.

A good drill should have a chuck capacity up to ¼″. The gears should be cut rather than cast, though they are somewhat more costly. With proper care, however, a diecast hand drill will give sufficiently good service. For sketches of other tools, see Figs. 5 to 10, inclusive.

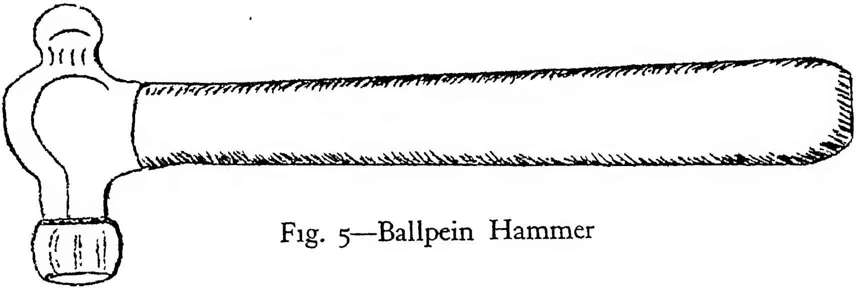
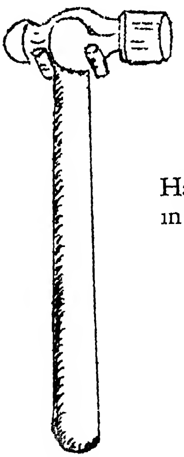
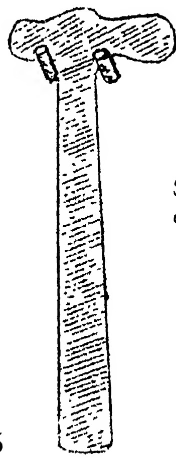


Fig. 5—Ballpein Hammer



Hammer in place



Silhouette of hammer

Fig. 6

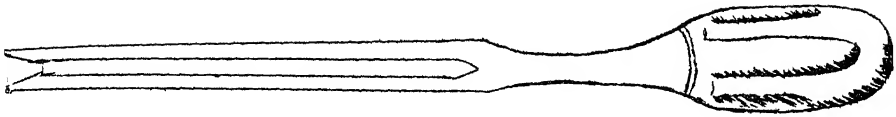


Fig. 7—Chisel, Plain Edge ½″

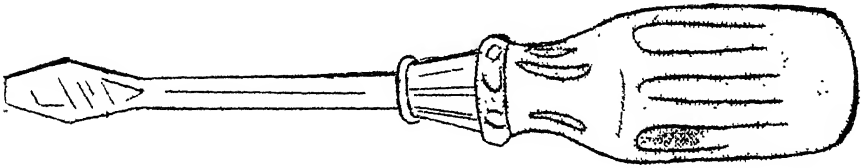


Fig. 8—Screwdriver

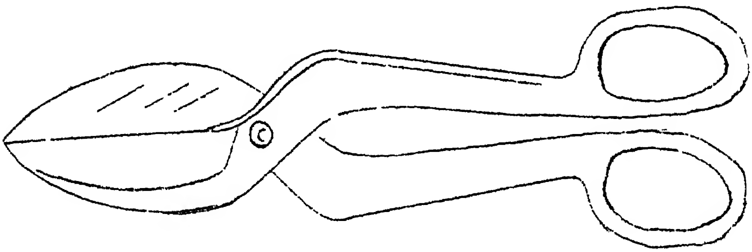


Fig. 9—Tin Shears, 7″ overall, 2″ cut

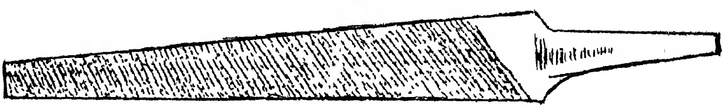


Fig. 10—File

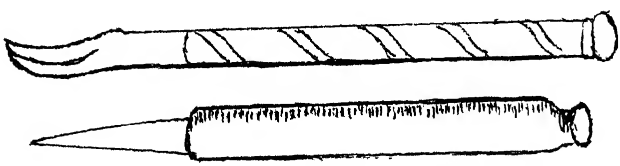


Fig. 11—Hand Made Modelling Tools—Tracers

A nut pick makes an excellent tracer.

From the illustration it is readily seen that the tracer is the nut pick with the point flattened and trimmed.

To do this, lay the nut pick on a metal block or anvil, and beat with a flat metal hammer. The point then is filed smooth and an emery cloth used to insure a perfect finish. The point should not be sharp. A small piece of rubber tubing, costing five cents per foot, is slipped over the handle. Soap is used to make it slip on.

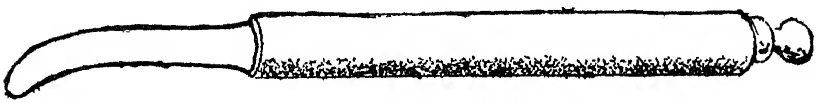


Fig. 12—Modelling Tool

By rounding the point still more on an anvil the same procedure will give you your modelling tool.

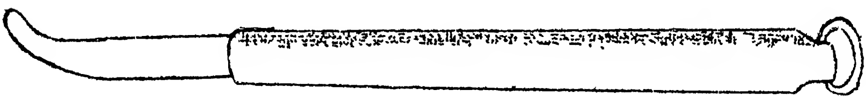


Fig. 13—Modelling Tool

Smooth the rounded end of the nut pick carefully with emery cloth.

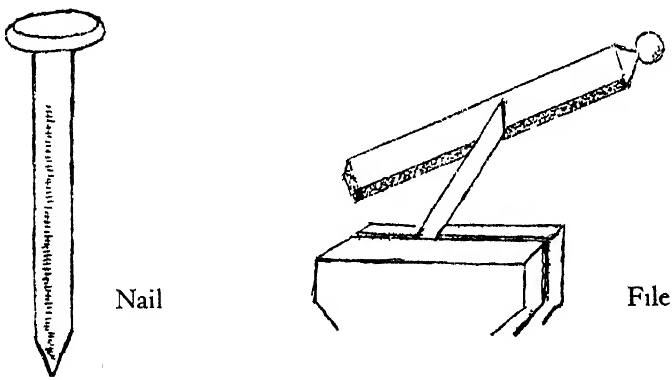


Fig. 14—Nail Modelling Tool

By filing down and bending the points in similar manner, 15-penny nails, which sell for one cent, can be made to serve the same purpose.

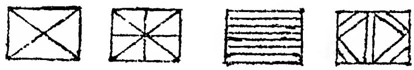


Fig. 15—Suggested Patterns for the Stamps

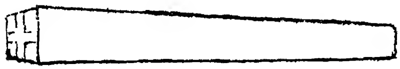


Fig. 16—Square Shaped Nail. A design may be set onto the nail's broad, flat end with a jeweller's file.

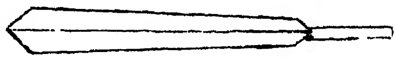


Fig. 17—Jeweller's File. Cost 8¢ to 25¢ each. The nail must be clamped in the vise and the file used to inscribe lines.

Simple background stamps may be constructed with nails. There is a small square shaped nail at five cents a pound in the hardware stores which makes an excellent stamp.

In preparing these tools it is best to have one commercial modelling tool to copy, since the curves must be done just right for best results.

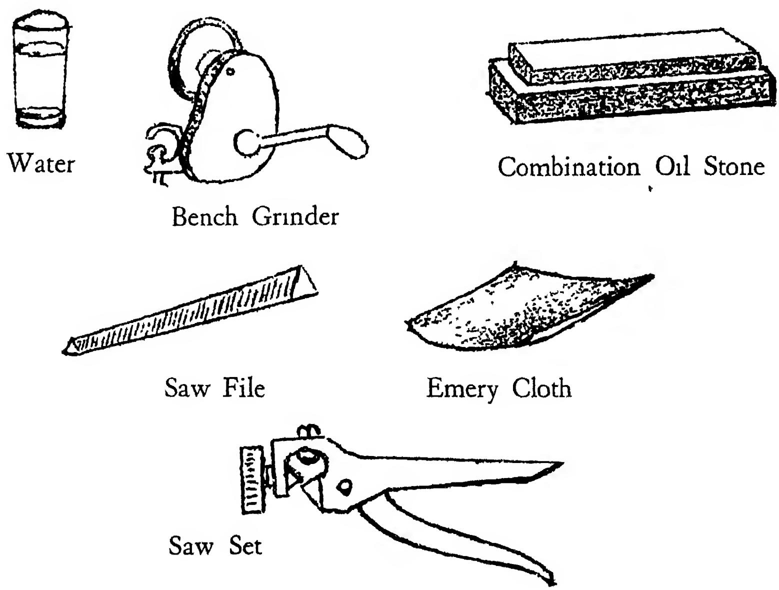


Fig. 18—Tool Conditioners

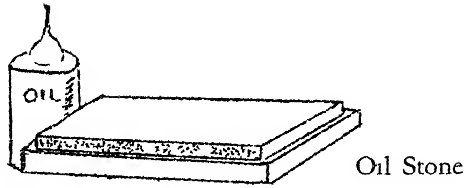


Fig. 18A—Care of Tools

It behooves a craft leader to have his tools well conditioned at all times. Records show that about 90% of the accidents in craft classes are caused by dull knives or broken tools.

Proper conditioning instruments depend upon what craft tools are being used, but a hand bench grinder and a combination oil stone usually suffice for the edged instruments.

Saws, and the pieces that must be kept polished, such as leather modelers and hammers, can be kept in trim with a saw set, some triangular saw files, and medium and fine emery paper.

It is suggested that a definite place for each item be set apart on the shelves, the back of the door, or the wall of the cabinet. Pegs, straps, or hooks can be utilised to support them. A painted silhouette or outline of each instrument, marked on its place, will further serve to identify the proper position. The teacher can check the missing tools quickly against the silhouettes, which is a further convenience. A small label bearing the name of the tool, and pasted beneath its place in the cabinet, will familiarise the student with the proper names.

For constructing tool cabinets, see Figs. 19 and 20.

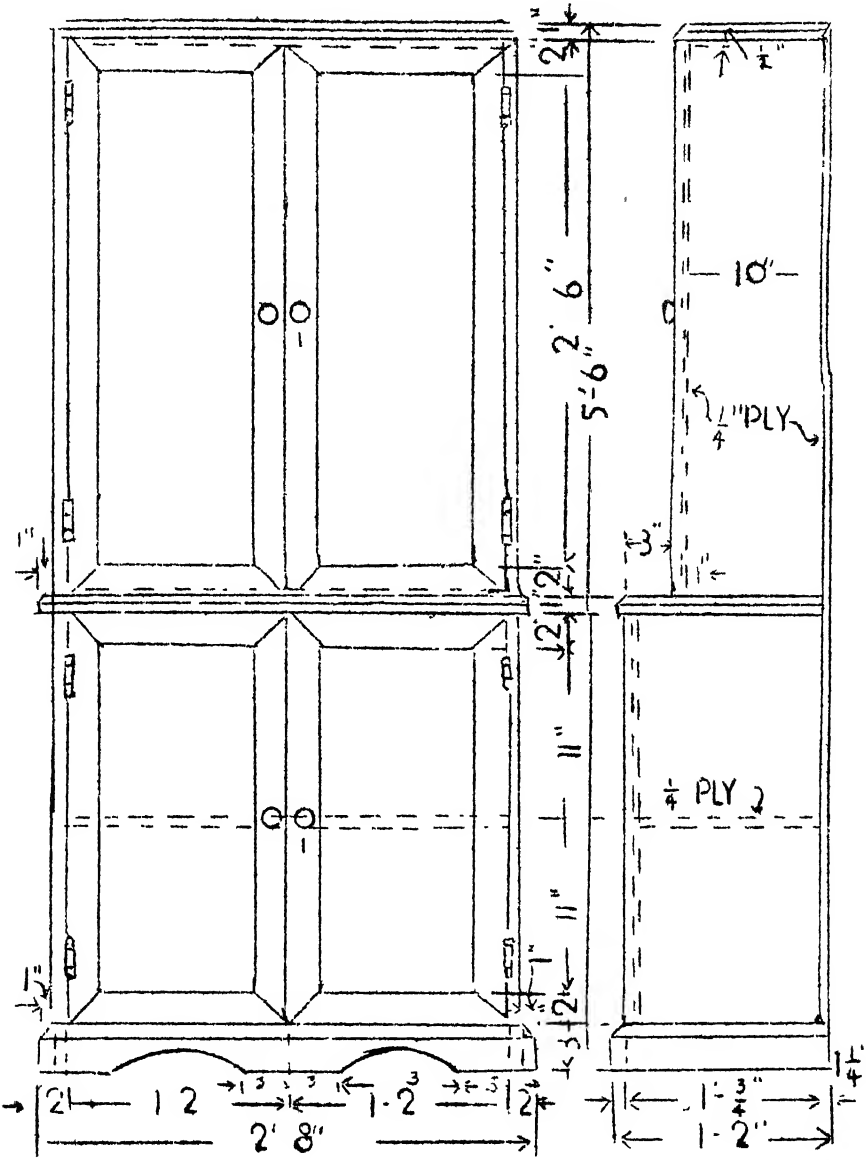


Fig. 19—Tool Cabinet

Front Elevation

Scale—1′ × 1′ × 0″

Side Elevation

List of Materials

Ponderosa White Pine—19′ × 12″ × 1″
White Pine—30′ × 2″ × ½″ (3-ply)
2-1/6 Boards—72″ × 36″ × ¼″

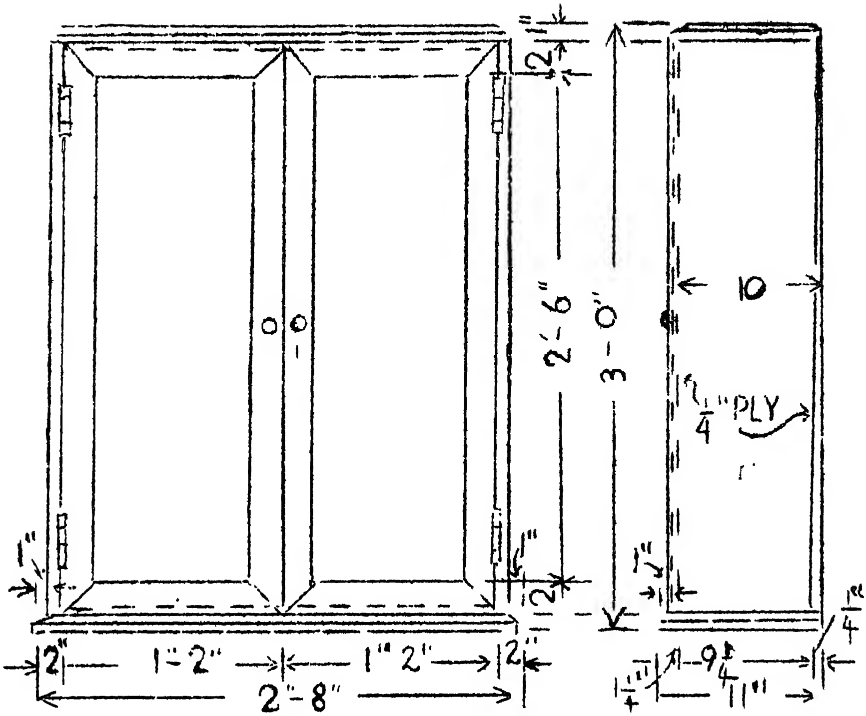


Fig. 20—Hanging Tool Cabinet

Front Elevation | Scale—1′ × 1′ × 0″ | Side Elevation

List of Materials

Ponderosa White Pine—11½′ × 12″ × 1″
White Pine—17½′ × 2″ × ½″
3-Ply 1-Board—72″ × 36″ × ¼″
4—2½″ Hinges—2—1″ Knobs

CHAPTER II

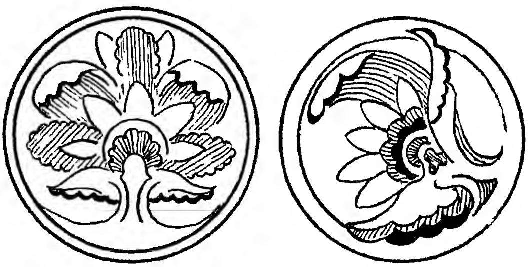
A Word About Design and Colour

IF YOU ARE a beginner in handicrafts you will probably copy or imitate at first, but this will not satisfy you after a while, and you will want to create designs of your own. If you are working with a group, you will find this to be true of almost every one, and rightly so. Unless we are complete automatons, doing things generates ideas, and we are naturally always seeking to make things finer and more beautiful.

The essentials of design are form, line, colour, and space. These essentials are interdependent and they are present in all created things. Unity, balance, rhythm, pattern, harmony, and contrast also enter in.

Balance is of the very greatest importance. If an object does not balance, no peace can be had with it. A feeling of equal distribution of space and form, either in small mass or large, expresses good balance.

Balance may be equal—which is known as bisymmetric—or unequal—which is asymmetric balance. (Fig. 1.)



Bisymmetric   Asymmetric

Fig. 1

Rhythm, or a feeling of movement, is established through the use of a continuation line, such as a diagonal, spiral, or curve. Rhythm is also established through the repetition of a motif. (Fig. 2.)

Emphasis or dominance is essential for making a design interesting. One portion of a design is made more important than any other through emphasis on that part. This may be achieved in a number of ways: repetition of a

form, colour, or line; by surrounding a light spot with one of dark, or vice versa; by using a spot of warm colour surrounded by cool colours, or cool by warm; by using a large unit surrounded by smaller ones; or by employing one curved line with many angular lines. Emphasis or dominance can also be established through the use of different sizes, different shapes, or different colours.

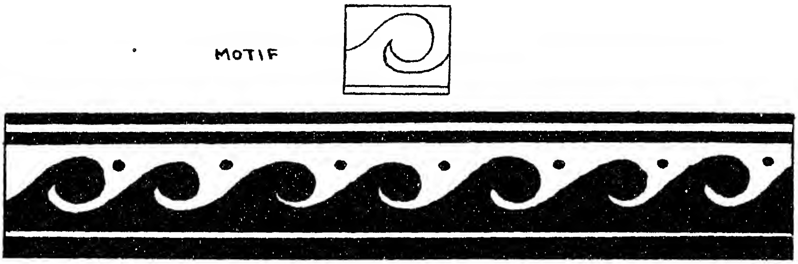


Fig. 2—Repetition of Motif for Border Showing Rhythm

If your subject is a tangible object, such as a leaf or a flower, the design need not be a duplication of nature. Exaggerate the part to be stressed and have the design an expression of it. The background, or the spaces left, must be interesting, as well as the design itself. (Fig. 3.)

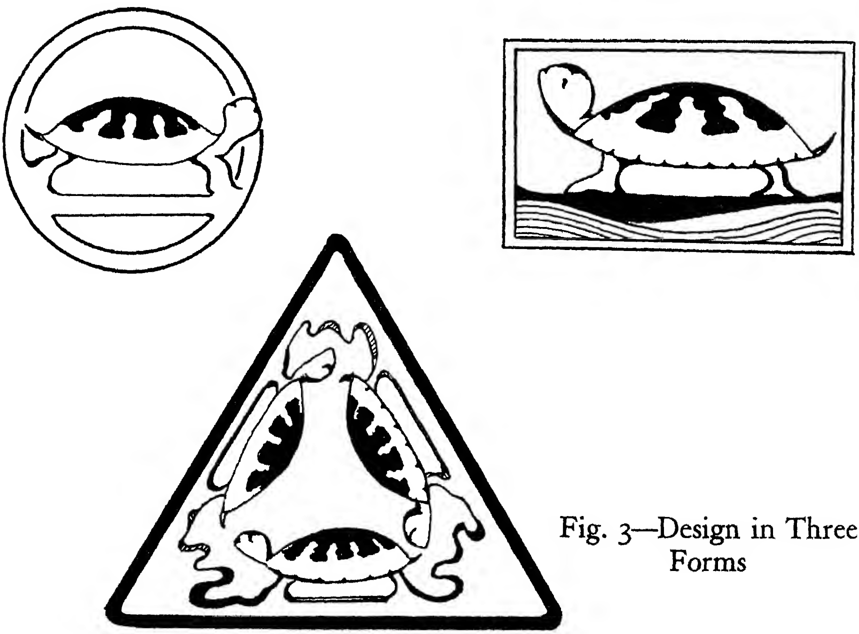


Fig. 3—Design in Three Forms

APPLYING DESIGN

When designing for craft articles, each craft presents a different problem. Structural design, or the form of the object comes before applied design, or the ornamentation of an object. The design should be applied to that part of the object where it would best enrich it. Simplicity is the keynote of good design for crafts. An undecorated object with good lines and interesting proportions is better than an over-decorated one.

The size and shape of the area to be decorated is the essential basis of the design planning. The same design or motif can be worked into any number of forms or shapes, but the design must not appear to have been forced into the area, and it must be appropriate to the object

TEACHING DESIGN

There are many schools and books on the teaching of design, each of which has its own approach and its own predilections. One writer—Adolfo Best-Maugard—in his book, "A Method for Creative Design," uses seven motifs from which, according to his theory, all things are derived.

There is much in this method that can be varied and used profitably in teaching design to children. From coloured construction paper, cut out various geometric shapes or shapes made at random. (Fig. 4.) A range of sizes

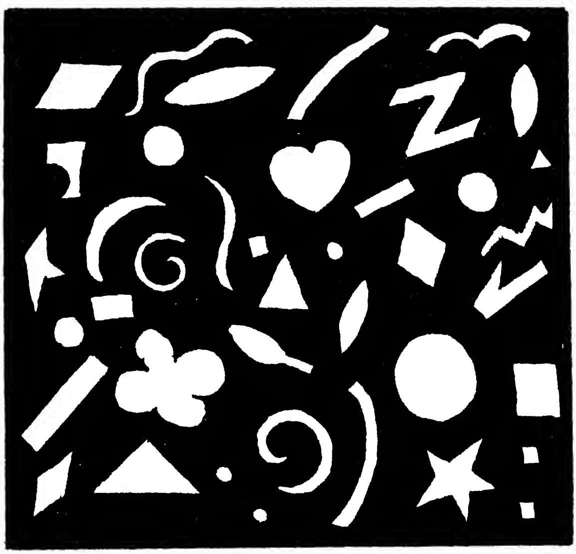
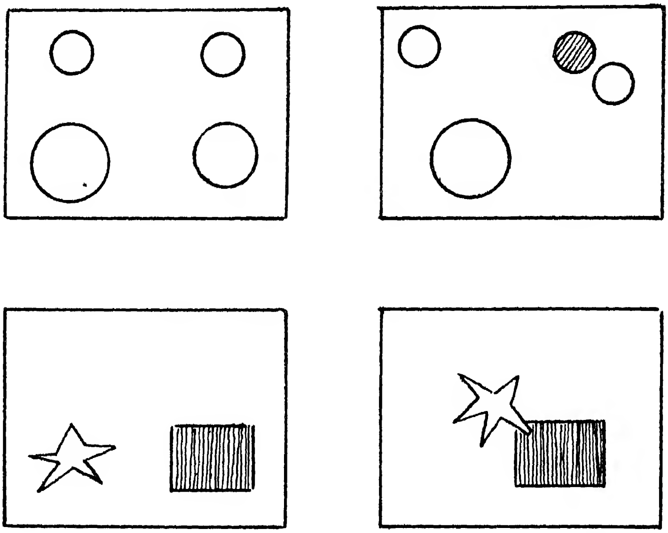


Fig. 4

and colours in each shape should be prepared. By having a variety of shades of the various tones, a sense of colour values will be developed, as well as some notion of form. As an introduction to designing, the children can be invited to select three or four shapes in whatever colours appeal to them and arrange designs with them. It can be made into a game on the principle of anagrams, and each child can see how many arrangements he can get from a given number of coloured geometric figures. (Fig. 5.)



Shapes Design

Fig. 5

Another way of instilling the fundamentals of design by means of play is to have an assortment of large music notes and sticks in different colors, and let the children work out patterns. This provides opportunity for discussing problems of balance, color, and unity. (Fig. 6.)

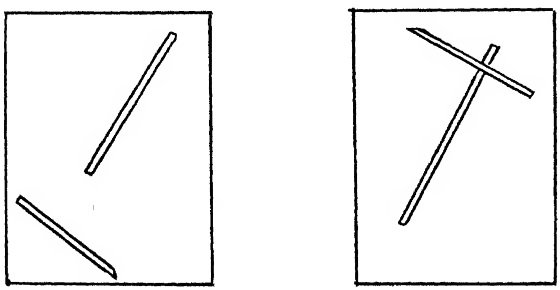


Fig. 6

One simple method of teaching creative design to beginners is the use of scribbles. Cover an entire paper with freehand, continuous scribbles, using a soft pencil, crayon, or charcoal. Then select certain lines or interesting shapes from the scribbles and line them heavily. This outline may suggest a desired design as shown in Fig. 7a. An imaginative person can easily develop this illustration into a seal, as in Fig. 7b, or a design of some other form.

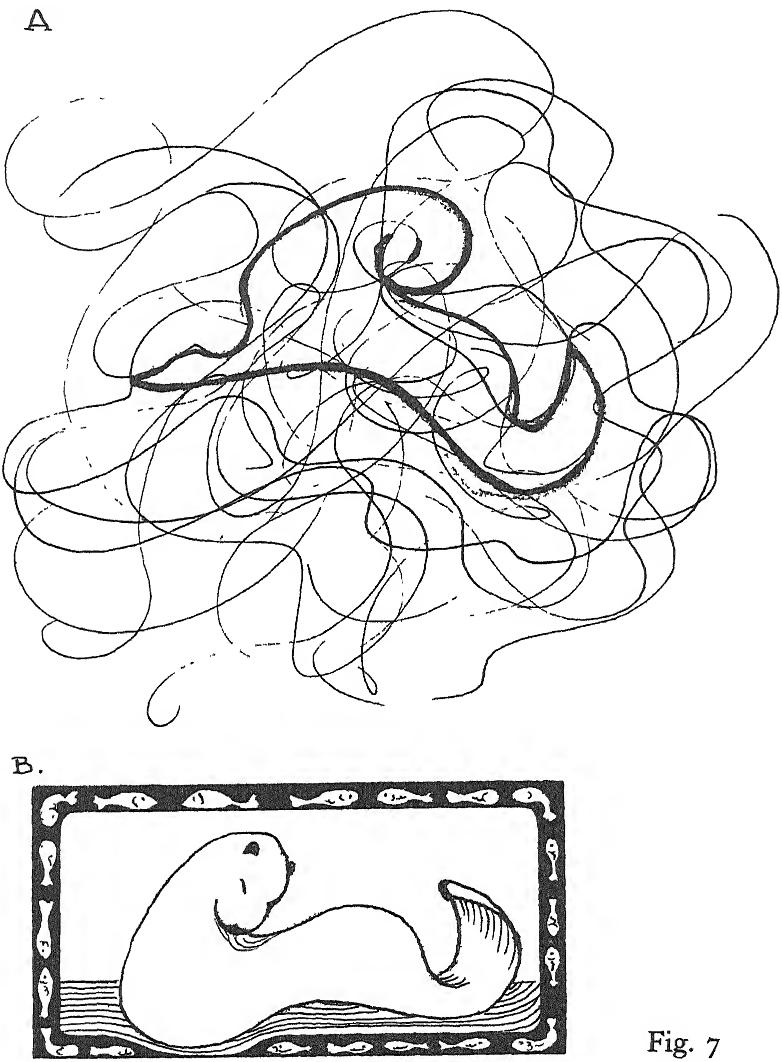


Fig. 7

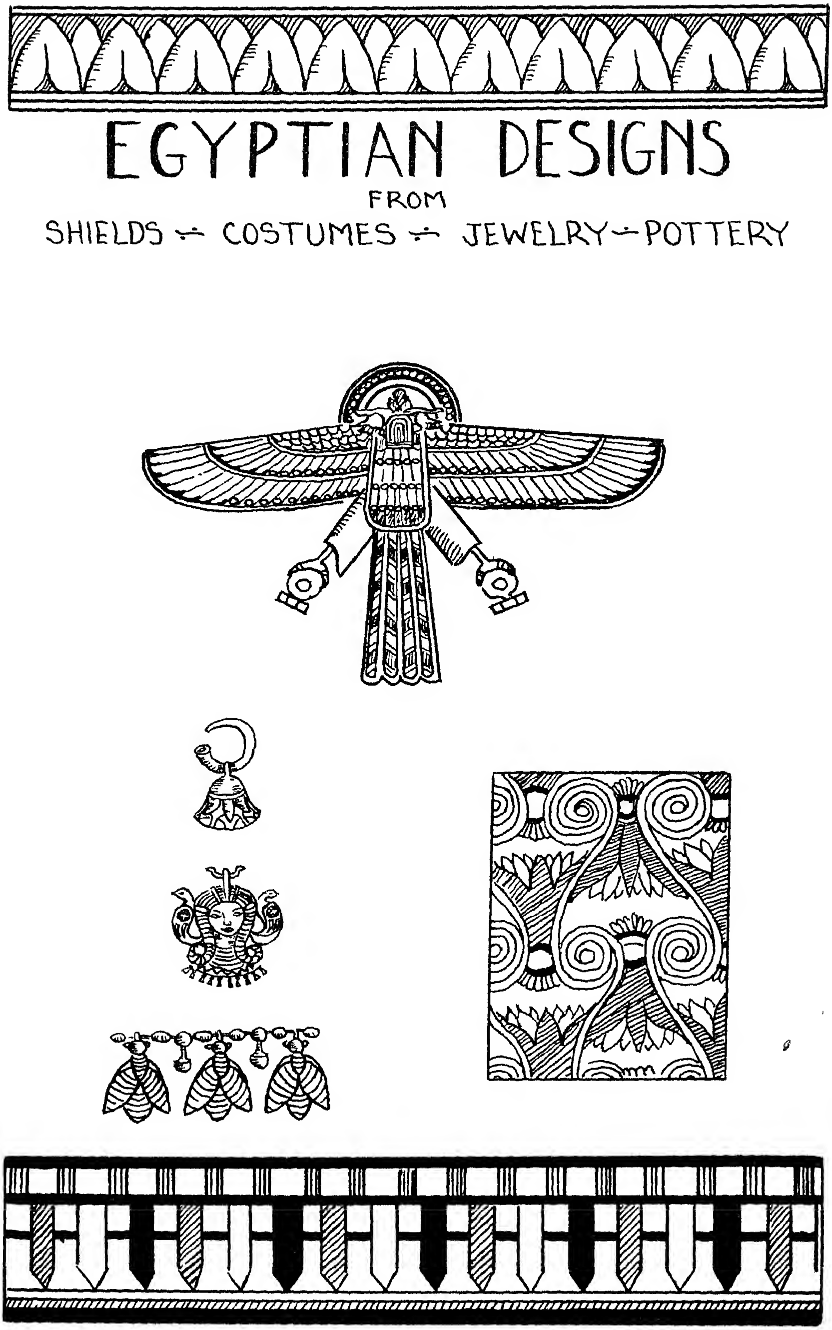


Fig. 8

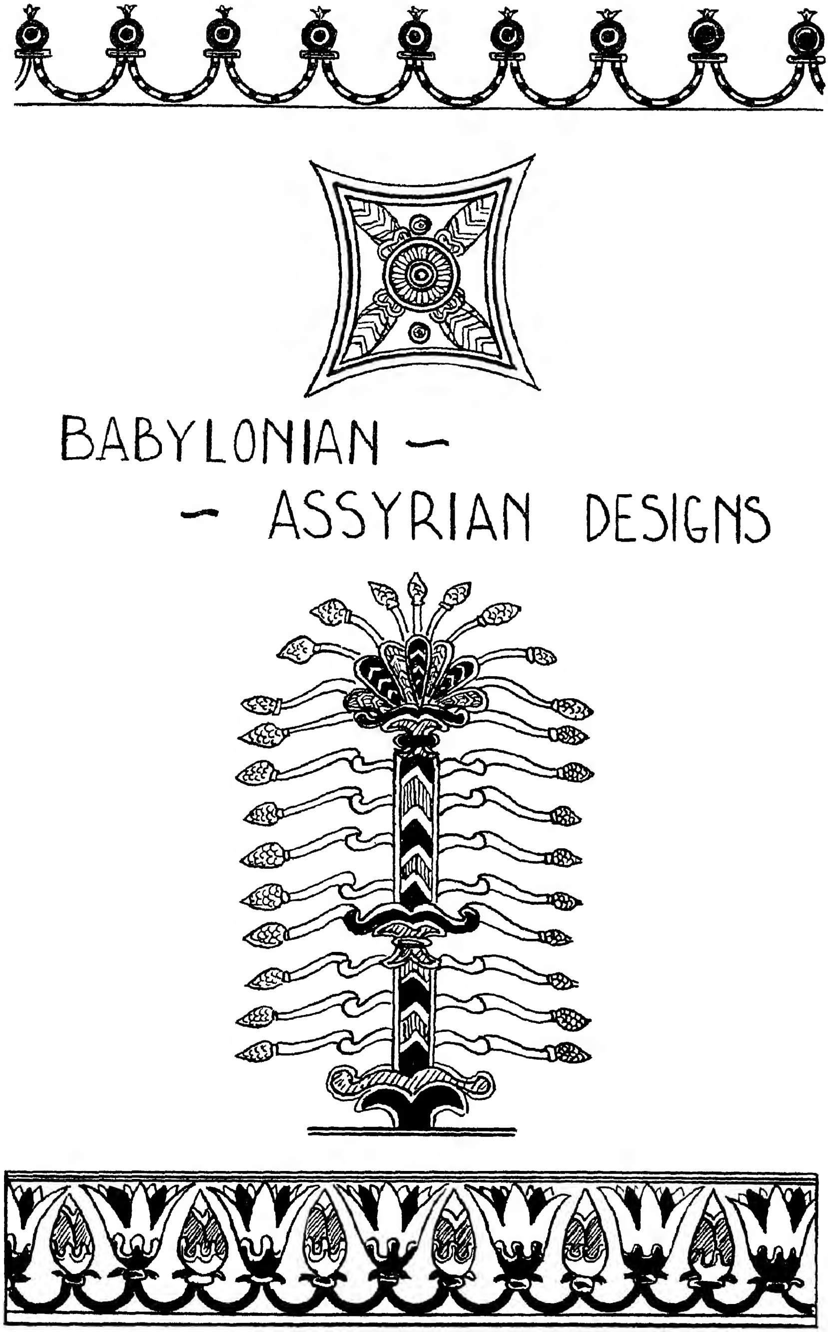


Fig. 9

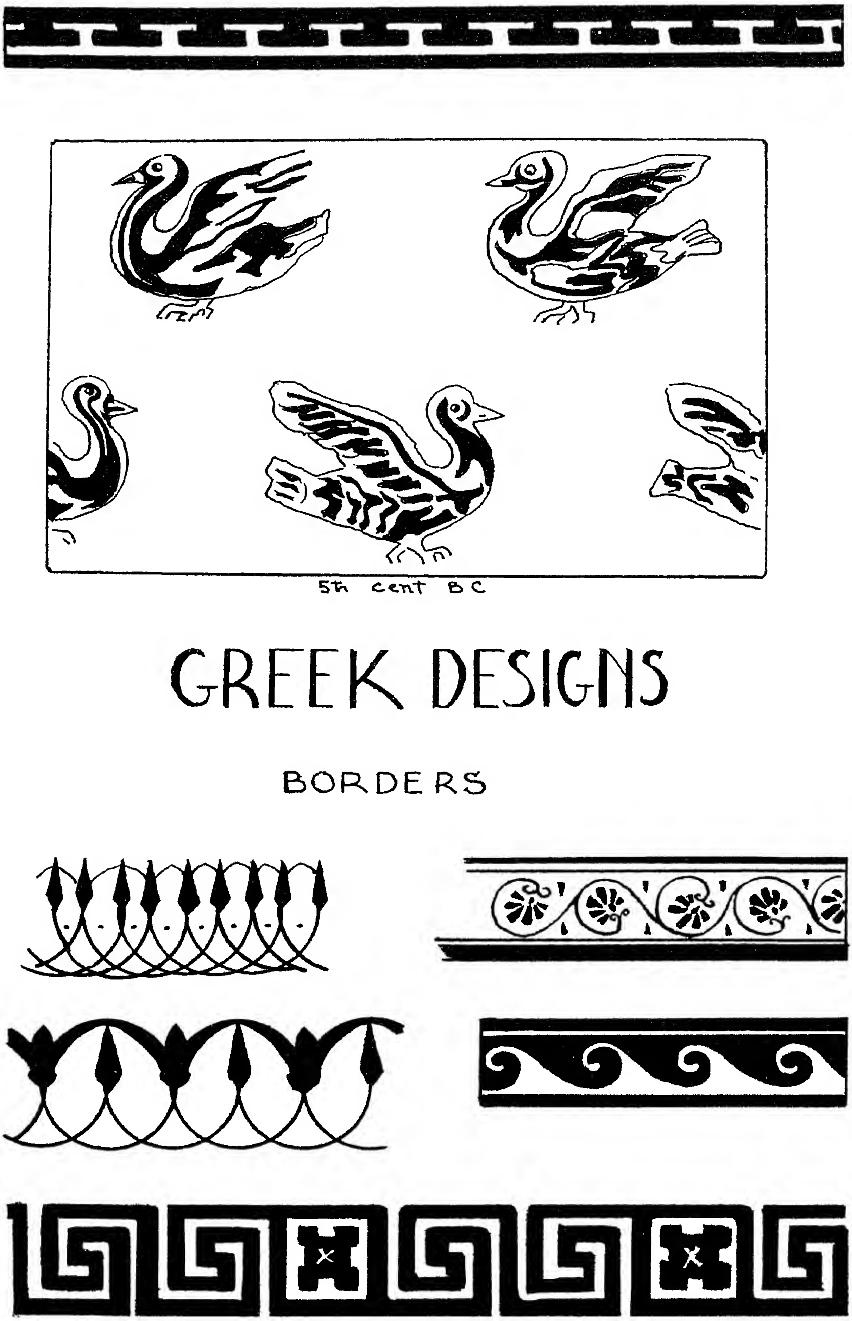


Fig. 10

SOURCE MATERIAL

It is oftentimes necessary to refer to some source material for designs of different countries, periods, and civilizations, for a specific reason. Throughout the entire history of design we find that artists were strongly influenced by the familiar natural forms surrounding them. These designs are associated with them.

Egyptian, Babylonian, and Assyrian ornament at once suggest the papyrus, the lotus, and the palm. Greek artists and decorators relied strongly on the vine, the olive, and the ivy. Gothic art made use of the oak, the maple, and other leafage, and so on through the different periods of civilisation.

The illustrations given here show designs taken from pottery, jewelry, costumes, and shields. (Figs 8, 9, and 10.)

Source material is an aid in suggesting ideas for any type of craft work. Do not be content, however, with museum and library material, but start a collection of your own, and encourage your group to do so. Sometimes one part of an old decoration will appeal, and can be developed and adapted in a new way. Old greeting cards, scraps of printed textiles, pictures of birds, animals, flowers, architectural motifs, all of these and many more things that you will think of yourself, will be a great help when you come to fashioning your own designs.

A SIMPLE WAY OF TEACHING THE USE OF COLOUR

It is important for the craftsman to know something about the principles governing the use of colours; also the order of colours, as well as practical combinations. This knowledge is not only valuable in its application to crafts, but for establishing standards of taste and judgment for personal possessions and surroundings, such as clothing and home decorations.

Besides some insight into colour harmony, there are other colour problems some knowledge of which is needed in simple craft work: colour mixing, warm and cool colours, penetrating and retiring colours, light and dark colours. An understanding and recognition of the three colour qualities—hue, value, and intensity—is the solution to these problems.

Hue is the quality which names a colour, such as red, blue, or yellow.

Value refers to the amount of lightness or darkness of a colour, such as light blue or dark blue.

Intensity refers to the amount of brightness or dullness of a colour.

The primary colours are red, yellow, and blue. All other colours may be

mixed from them. However, there are various hues of red, blue, and yellow, also of green. There is Prussian blue, ultra marine blue (most commonly used), cobalt blue (sky blue), and the other primaries are likewise subdivided into different hues, known by various names.

A colour is dulled in intensity (brightness, purity) by mixing it with its complement. This also darkens the colour if it is light.

A colour can be darkened by adding black. This method is poor for design, however, as the colours become dingy. Pure colours are generally dark enough for block printing and stencilling on textiles, and if not they can be darkened and dulled sufficiently with the complement.

A colour can be lightened by adding white.

A good colour scheme does not use all colours of the same value (degree of dark or light) or intensity, nor all warm or all cool colours. One colour should predominate for emphasis.

Warm Colours—red, red-violet, red-orange, orange, yellow-orange, yellow, yellow-green.

Cool Colours—violet, blue-violet, blue, blue-green, green.

Anadogous Colours—Neighbouring colours on the colour wheel, i.e., blue, blue green.

Complementary Colours—Opposite colours on the colour wheel, i.e., red and green, or blue violet and yellow orange.

Monochromatic Colours—One colour in several values, black and white added.

Triad Colours—Every fifth colour on the colour wheel, three in all, i.e., orange, green, violet; or, yellow, blue green, red violet. (See illustrations of colour wheel.)

THE COLOUR WHEEL

A colour wheel should be displayed in all craft rooms. This working chart can be a decoration, as well as an interesting and useful object. Animal, star, or flower shapes cut from lightweight cardboard can be used for mounting the colour scale. Accurate colours in coated or construction paper can be bought in packages containing an assortment of 36 colours, tones, and shades. One pack will contain an assortment sufficient to construct a colour wheel chart showing hue, value, and intensity.

Fig. 11 shows a simple colour wheel and Fig. 12 a more decorative one with the colours set on in the shape of leaves.

Children will enjoy making colour wheels for themselves. It is easy to show them that the six-pointed star in Fig. 11 is made of two equilateral

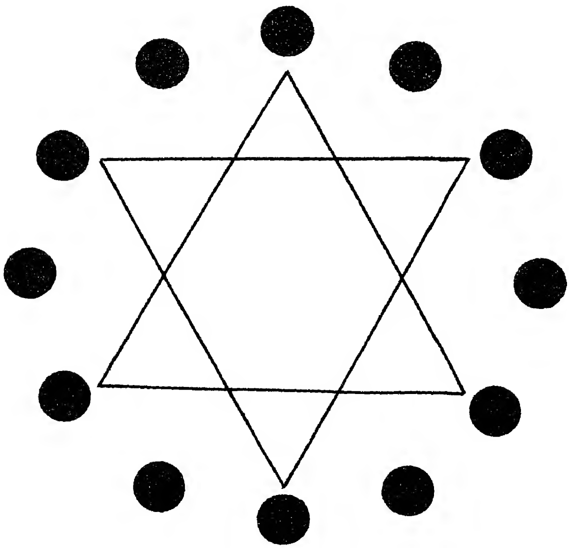


Fig. 11

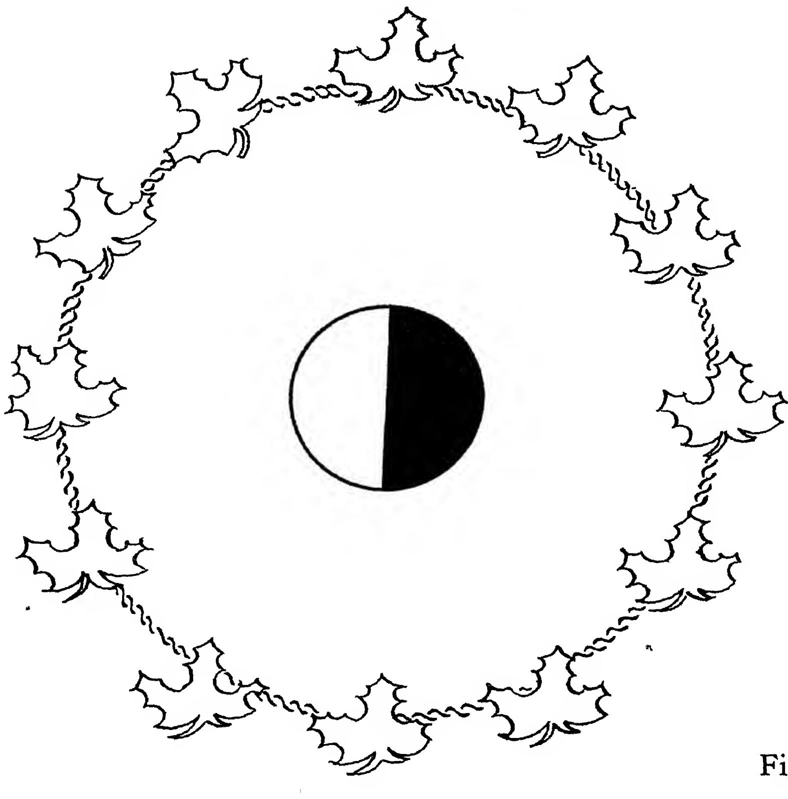


Fig. 12

triangles, one upright and one inverted. At the apex of the upright triangle put a circle of primary red, and at the apex of the inverted triangle put primary green. The other colours are then added in the following order, working to the right from the red circle at the top: red violet, violet, blue violet, primary blue, blue green, primary green, yellow green, primary yellow, yellow orange, orange, red orange, twelve in all, seven spectrum colours and five intermediate.

From this simple colour wheel you can begin the teaching of colour theory in a very easy way by using a spinning wheel or markers set into the centre of the colour chart. The markers can be made of light weight cardboard. (Figs. 13, 14, 15, 16.)

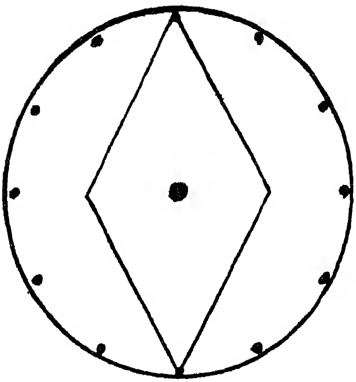


Fig. 13—A harmony of colours from the opposite sides of the wheel is called complementary harmony. This gives decided contrast, which can be softened by adding one of the colours to the other. A diamond-shaped pointer moving around the wheel will indicate the colour complements.

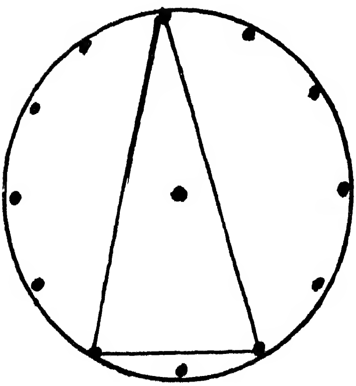


Fig. 14—An isosceles triangle spinning around the colour wheel will give that harmony of colour which is called split complementary. Thus, if the apex of your triangle points to primary red, the suggested complements will be, instead of primary green, yellow green and blue green.

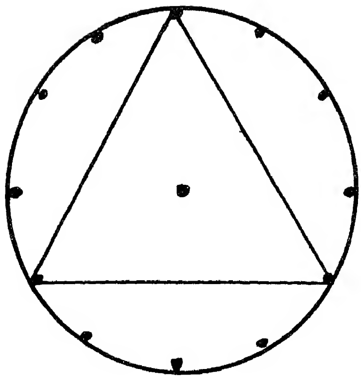


Fig. 15—To show triads use an equilateral triangle as shown at left. This suggests a combination of colours at intervals of five on the colour wheel, giving variety without harsh contrast.

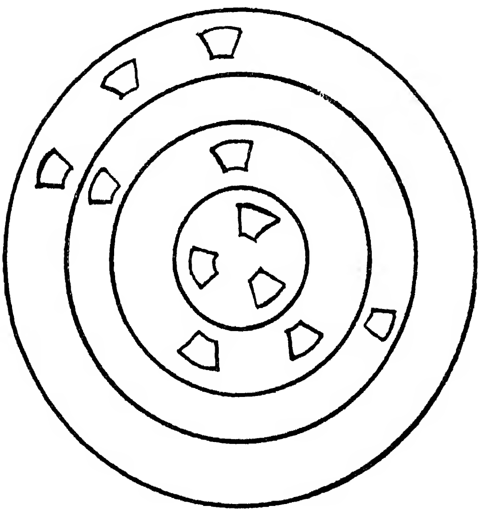


Fig. 16—The colour wheel shown at left is a summary of all the others. It is made of four circles rotating on each other. The smallest innermost circle is perforated to show the triads; the next the split complements; the third the complements, and the outer circle to show the neighbouring colours.

Colour harmony is a fascinating and practically inexhaustible subject which can only be touched on here, but by setting up a simple colour wheel and then making several others with the spinning markers as shown in Figs. 13, 14, 15, and 16, you will have made a good beginning. If you wish to pursue the subject of colour you will find in the bibliography the names of some books that will be helpful and interesting.

Papercraft

Paper craft speaks for itself so quickly that the best way to learn about it is to surround yourself with an assortment of coloured papers, scissors, and paste, and see how quickly ideas of what to do with them will unfold to you. Children of pre-school age usually get their introduction to crafts through paper work, and it has also many interesting possibilities for the mature craftsman.

The projects described hereafter deal with the use of the more ordinary kinds of paper, which can be found in almost any locality, and which cost but little. Even newspaper and wrapping paper have their practical and decorative possibilities.

There are, as well, many exquisite and unusual kinds of paper, and it would be a good adjunct to a craft program to experiment in paper-making. In the bibliography at the end of the book you will find listed a pamphlet which will tell you how to go about it.

The history of paper-making is of extraordinary interest. It originated in China in 105 A.D., and in the British Museum is a specimen of some of the earliest paper, which was discovered in the Great Wall. Several Chinese paper-makers were captured by Arabs in 650 A.D., and they taught their captors the wonderful process. The Arabs appreciated its value, and with shrewd foresight set up a monopoly in Baghdad.

The Crusaders brought back samples and tales about this new art, and later Egyptian paper found its way into Europe through Sicily and Italy. The Moors carried the paper process into Spain in the 11th century.

Paper-making was begun in England and America at about the same time. The first American mill was built by William Bradford in Pennsylvania, and he found a paper-maker named William Rittenhouse to take charge of the work. Rittenhouse Square, in Philadelphia, was, quite fittingly, named for him. The demand for paper grew by leaps and bounds, and the mother country taxed it, along with tea and other things. So we find in pre-Revolutionary days, that states were lending money to individuals to build paper mills, and offering prizes, too, to stimulate the young industry. Rags were at a premium, and we can see how the humble rag-man came to be

famed in song and story, performing, as he did, so vital a service. The cultural life of man is bound up with literacy and recording, and, before paper was discovered, this was necessarily tedious and limited. So the paper-crafter, young or old, should have deep respect for his medium.

TECHNIQUES OF PAPER DESIGNING

Simple Cuts and Folds

For creating original ideas, the use of paper cuts and folds is an excellent working medium in all craft programs.

Creating with scissors, paste and folded paper does not necessarily require artistic talent, for, with a little experimentation and practice, delightful new designs may be the reward.

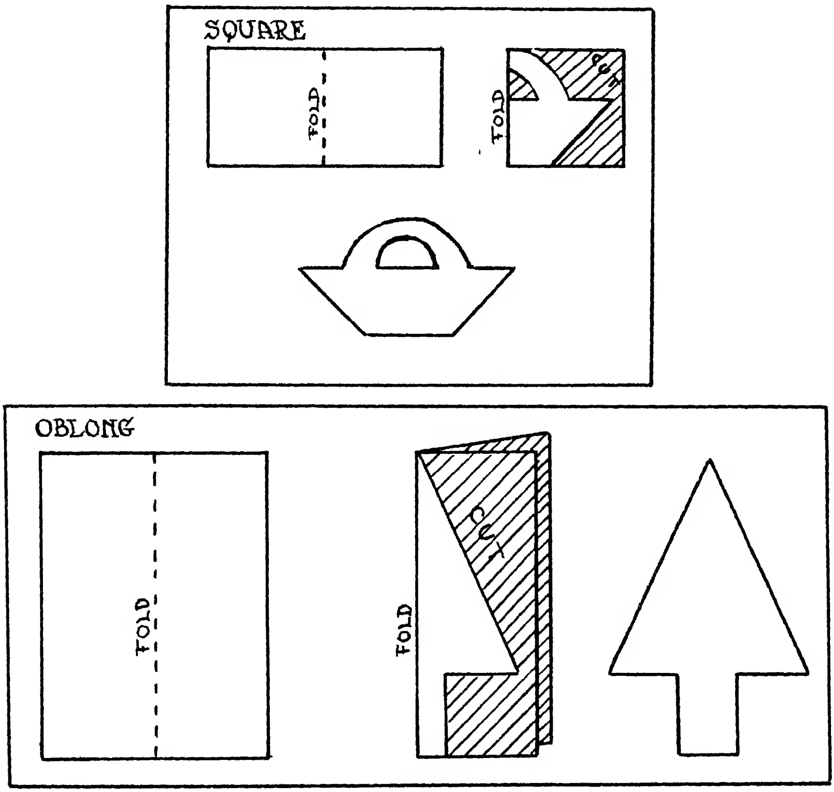
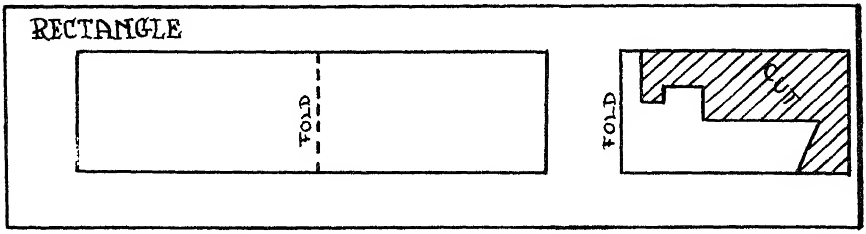


Fig. 1—Basic Folds



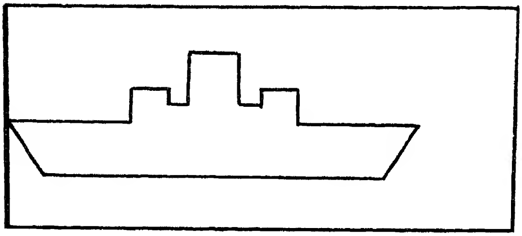


Fig. 1—Basic Folds
(*Continued*)

Any one fold of a piece of paper permits a single unit of design. The centre of the design should be on the folded edge of the paper. Plain, simple designing can be done in this manner very easily and accurately.

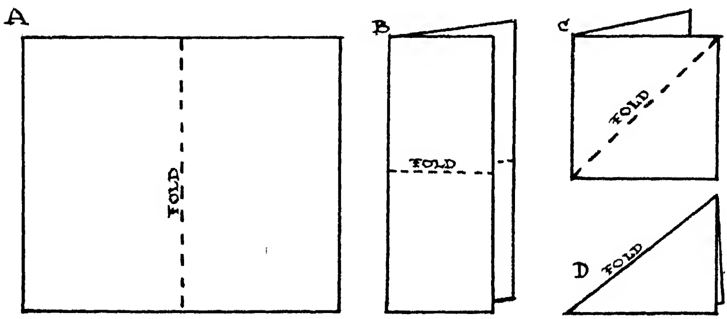
Figure I shows several designs which can be applied toward the making of interesting paper projects, suitable for many occasions.

Surprise Cuts

Cutting at random produces unusual pattern effects. Numerous cuts close together give a lacy design. You will be surprised at the variety of patterns that will appear. Geometric shapes—squares, rectangles, diamonds, circles—and other pictorial effects can be achieved in this way.

Directions for Square Fold

Six-inch piece of paper cut square (A) (Fig. 2.)



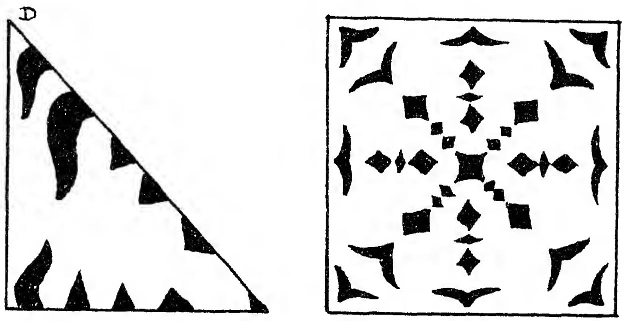


Fig. 2—Square

Fold vertically down the centre and then fold in half. (B.)

Fold diagonally through the centre. (C.)

The paper is now ready for cutting. Mark pattern first with pencil or make odd shaped cuts and slashes directly with scissors on both folded edges. (D.)

Directions for Circular Fold

Fold a square of paper as in the first two steps of the square fold. (Fig. 3.)

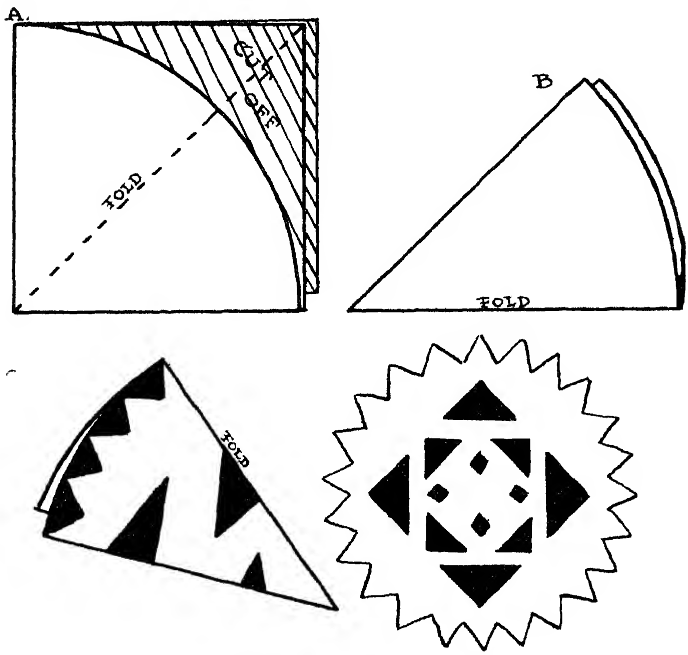


Fig. 3—Circle

Scribe a curved line from upper left folded corner to lower right folded corner, and cut away shaded area. (A.)

Fold remaining piece diagonally through the centre. (B.)

Scribe a curved line from upper left folded corner to lower right folded corner, and cut away shaded area. (A.)

Fold remaining piece diagonally through the centre. (B.)

Mark pattern on both folded edges and cut slashes.

Dolls in a circle or any repeat design can be obtained by this method of folding.

Directions for Triangular Fold

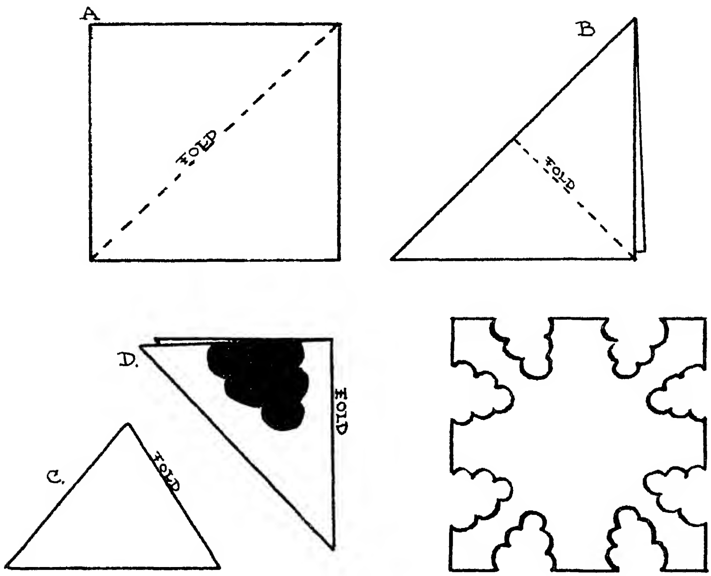


Fig. 4—Triangle

Repeat first two steps of the square fold. (A.) (Fig. 4.)

Fold diagonally through the centre. (B.)

Fold again diagonally through the centre. (C.)

Holding the folded edge to the right, cut away an area from the part of the triangle. (D.)

Directions for Octagonal Fold

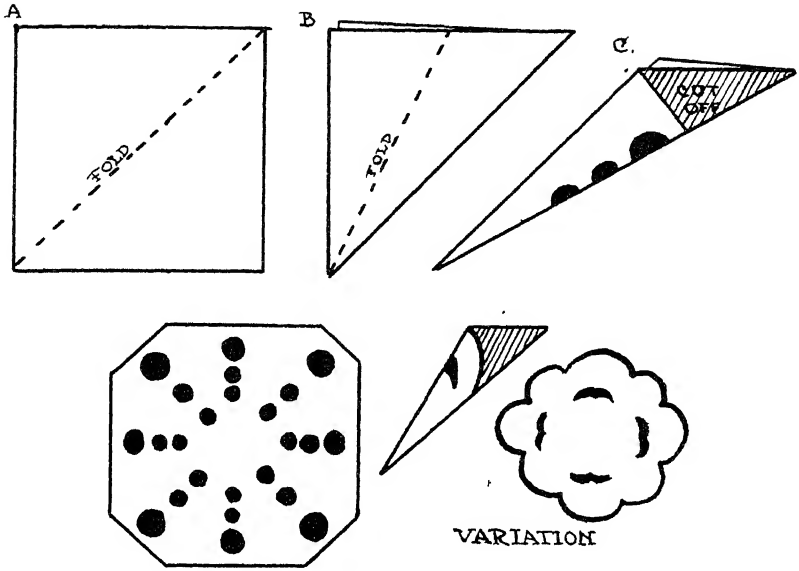


Fig. 5—Octagon

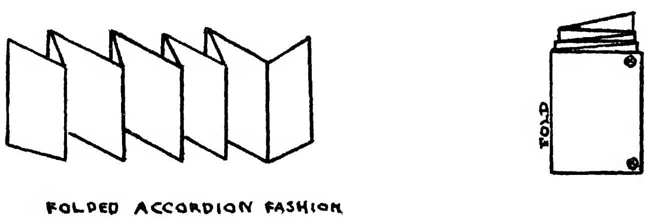
Repeat first three steps of the square fold. (A.) (Fig. 5.)

Fold directly in half from folded edge to folded edge. (A.)

Four corners extend beyond the folded paper, and these are clipped flush with the open edge of the paper. (C.)

Cut slashes in both folded edges. (C.)

Folding a long rectangular strip of paper over and over in accordion fashion (Fig. 6), will result in rows of figures, trees, geometric forms and other patterns. *Always take care not to cut away all of the folded edges,* since these edges act as hinges for joining the repeat designs as illustrated in Fig. 6.



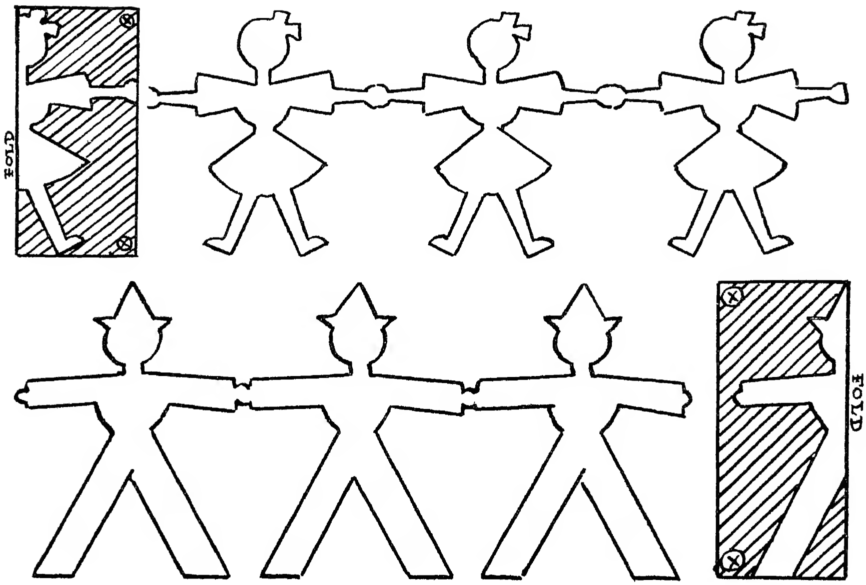
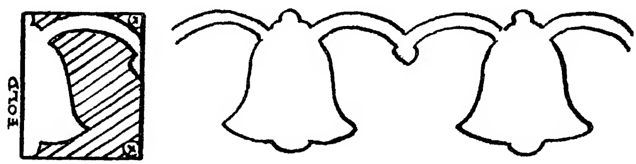
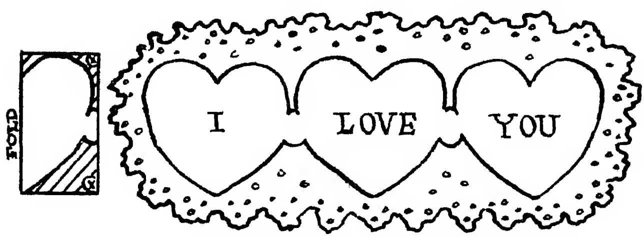


Fig. 6—Surprise Cuts and Folds

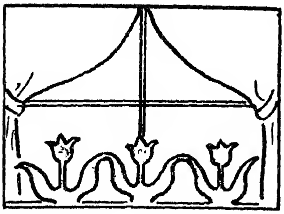
Making novelty posters, party favors, and room decorations for special events will yield hours of enjoyment for both young and old. (Fig. 7.)



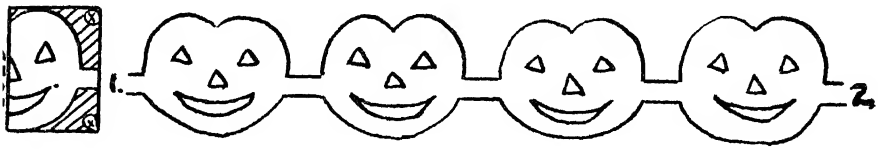
Christmas Decoration—Series of Hanging Bells

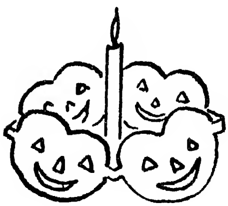


Valentine Greeting Card Mounted on Lace Paper



Easter Window Decoration





Hallowe'en Jack-o'-Lantern Table Piece

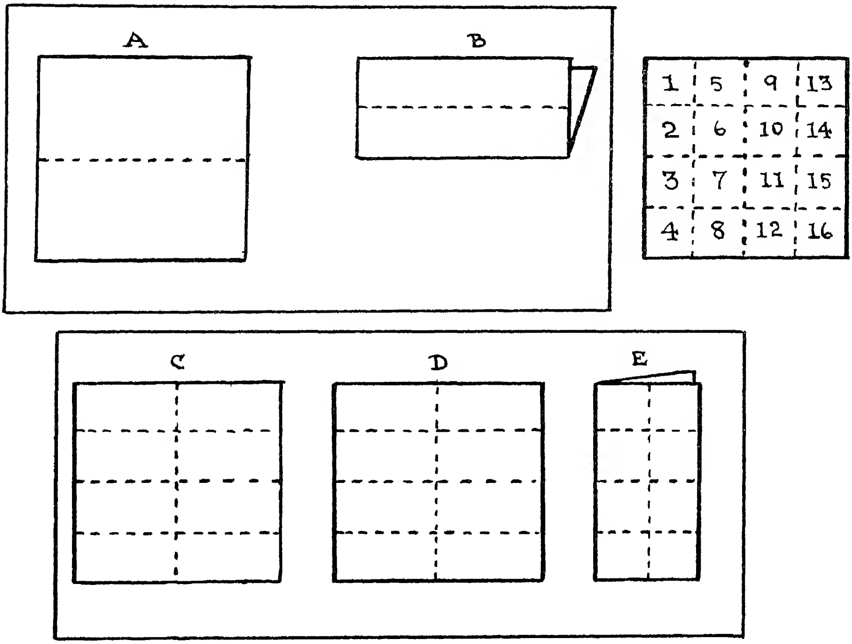
Paste ends 1 and 2 together

Fig. 7

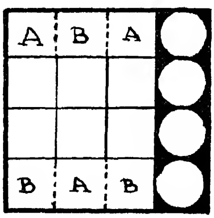
Cut and Folded Projects

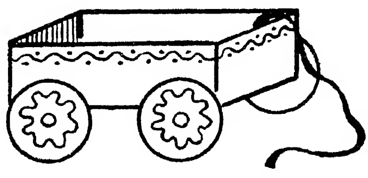
A sixteen-box fold is the basic fold used for the construction of the suggested projects. To obtain a sixteen-box basic fold, a square piece of paper is folded in half horizontally, and then in half again. Repeat folding procedure vertically. (Fig. 8—A, B, C, D, and E.) Gaily colored construction papers make attractive projects. Decorative patterns may be applied to the surfaces with paint, crayon, or tiny cut pieces of contrasting coloured papers pasted mosaic fashion. The diagrams are simple to follow, and with a little ingenuity you can construct a house, barn, interior furnishings and a landscaped garden. For a farm setting, these folded suggestions are especially adaptable.

Wagon—Cradle—Garden Basket (Fig. 8).

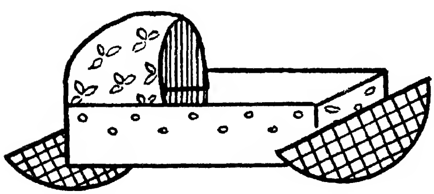


Sixteen-Box Fold

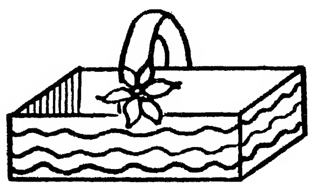




Wagon



Cradle



Garden Basket

Fig. 8

Cut off shaded area.
Slash on broken lines
Paste A's over middle B.

From the shaded strip cut circles; for wagon wheels Use semi-circles as cradle rockers and use the strip as a basket handle. Decorate as suggested.

House—Barn—Garage (Fig. 9).

Slash on broken lines.
Overlap middle B's and paste. (A.)
Paste A's half way over pasted B's. (B.)

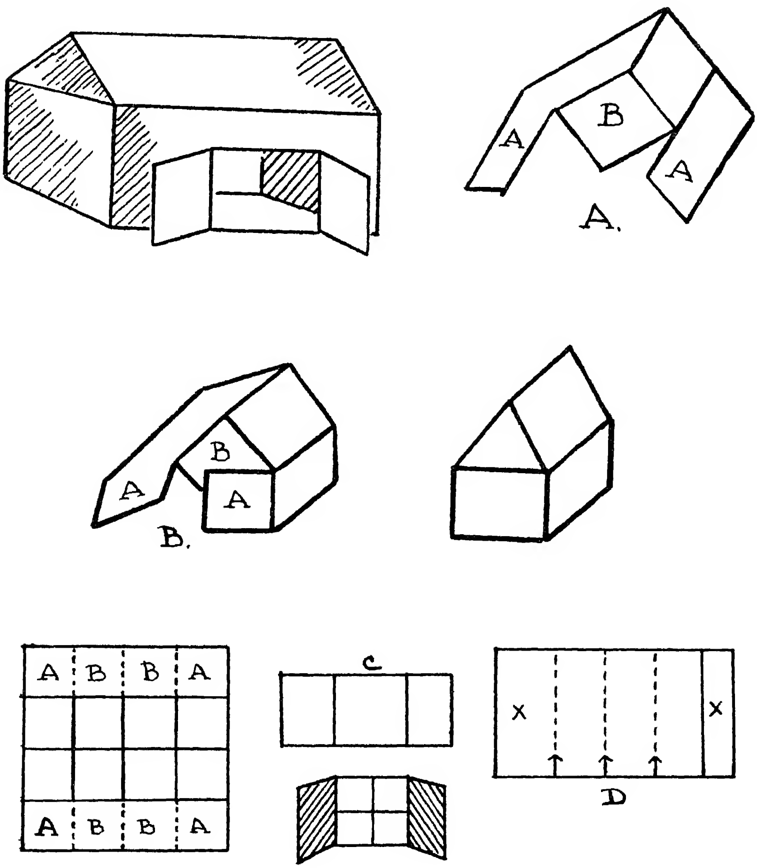


Fig. 9—House, Barn, Garage

Fig. 9 (*Continued*)

Cut two pieces of contrasting coloured paper $1'' \times \frac{1}{2}''$, and fold in thirds, bending sides forward to form windows and shutters. Mark window panes with pencil and paste to the sides of the house. (C.)

Follow D, slashing lower section to arrow heads. Paste X over X. Mark to simulate bricks and paste the completed chimney to the roof of the house.

Furniture (Chair) (Fig. 10).

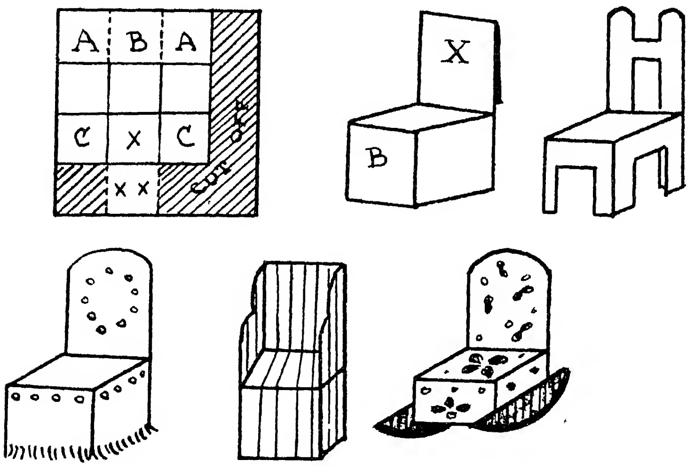


Fig. 10

Cut away shaded area.
Slash on broken lines.
Paste upper A's over B.
Fold XX over X and paste.
Paste C over C.

By fringing the base, adding arm pieces, or cutting half circles for rockers, the design of the chair may be varied.

Furniture (Bed) (Fig. 10-A).

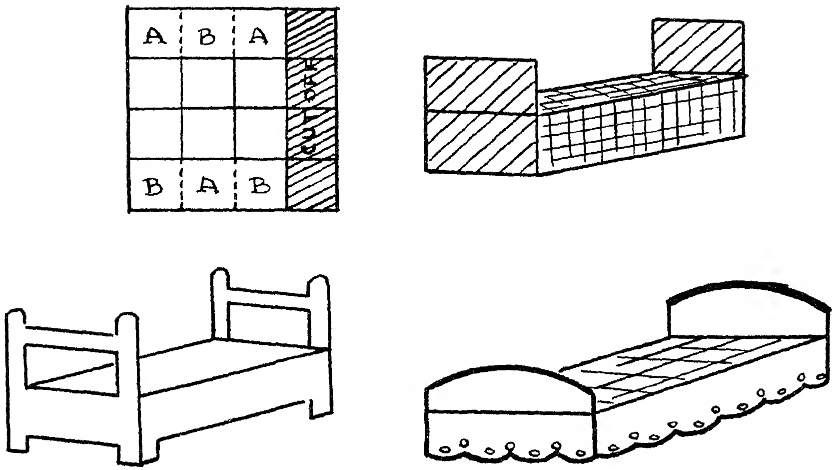
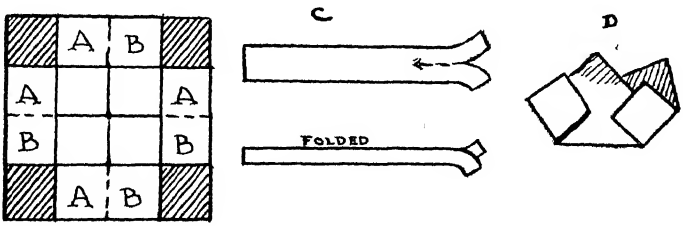
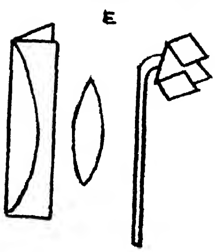


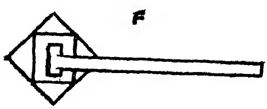
Fig. 10-A

Cut away shaded section
Slash on broken lines.
Fold upper B and lower A forward (head and foot board.)
Paste A over A and B over B.
See Fig. 10 for decorating suggestions.

Floral Display for Landscaping (Fig. 11)







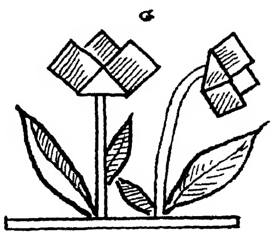


Fig. 11—Floral Display

Cut away shaded areas.

Paste A over B and repeat until all A's overlap the B's.

From a strip of paper 1″ × 6″ cut a stem for the flower, by slashing as illustrated in C. Fold in half. Paste the slashed ends to the base of the Flower. Using the half fold, cut leaves of various sizes and paste to the stem. (D, E and F.)

Pastel-coloured papers make attractive flowers when arranged in groups (G.)

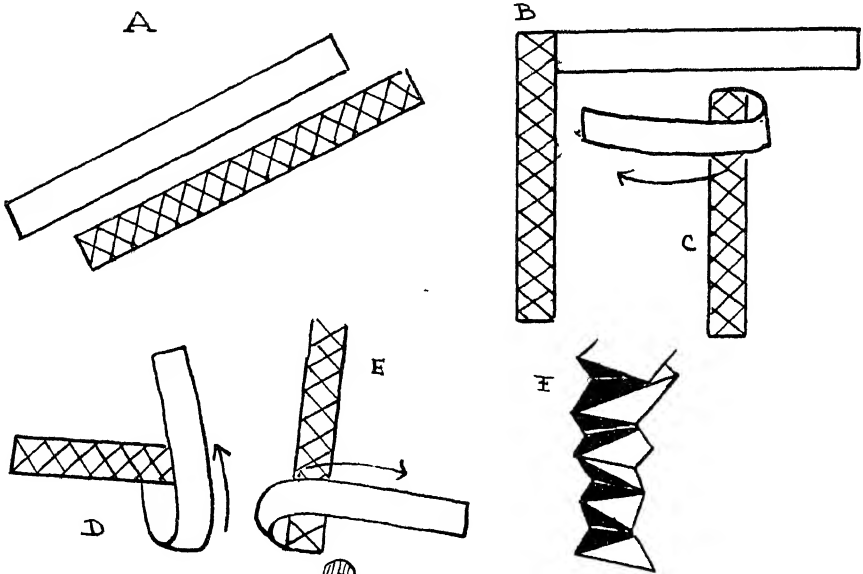


Fig. 12—Dancing Clown

Dancing Clown (Fig. 12).

Cut two pieces of contrasting colored construction paper, 1″ × 6″. (A.)

Paste one strip of paper over the other strip at right angles. (B.)

Fold as illustrated, and repeat folding procedure until both strips of paper have been folded to the ends. (C, D, E, and F.) Paste the ends securely.

From lightweight cardboard, cut two circles and decorate to resemble a comic clown. Paste the folded strips to arms and legs. Attach coloured yarn or string to the hands and feet of the clown and you will have a sprightly active dancing figure.

TRICKS WITH PAPER

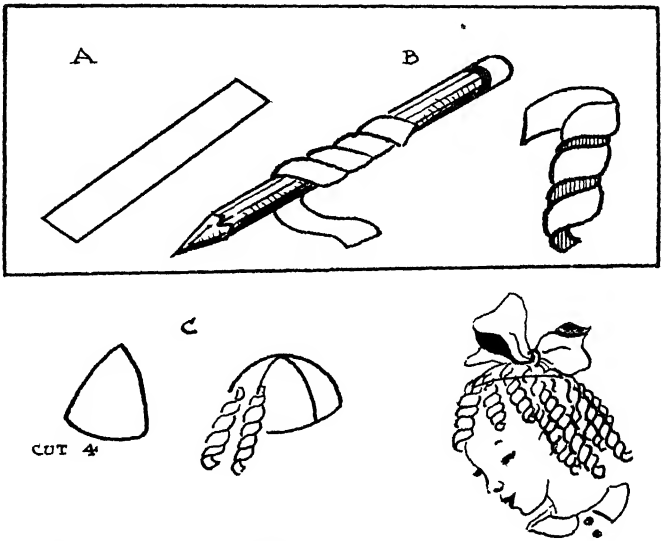


Fig. 13—Curled Papers

Materials required: coloured construction paper, paste, scissors, pencil.

Cut a series of strips of paper 1″ × ½″. (A.)

Wrap each strip tightly around a pencil, dowel stick or similar object. (B.)

Remove the curled paper from the pencil and paste each curl to a wig foundation. (C.)

Yellow, white and black papers make attractive head-dresses for party affairs and pageants.

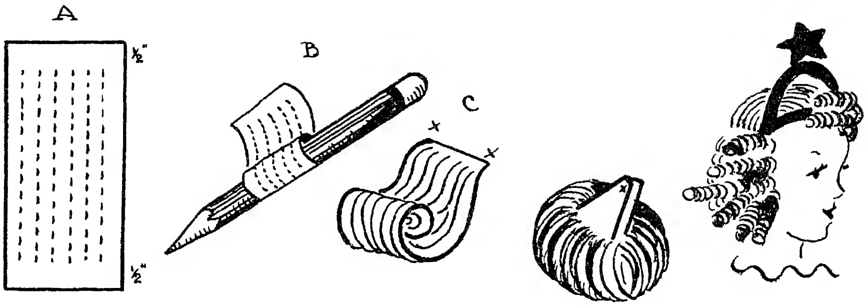


Fig. 14—Ringlets

A piece of paper, 2″ × 6″, is slashed vertically to within ½″ of either end. (A.)

Wrap tightly around a pencil. (B)

Remove tightly rolled ringlet and paste X to X. (C.)

Paste to a wig foundation as in illustration C for Curled Papers.

Spirals (Fig. 15).

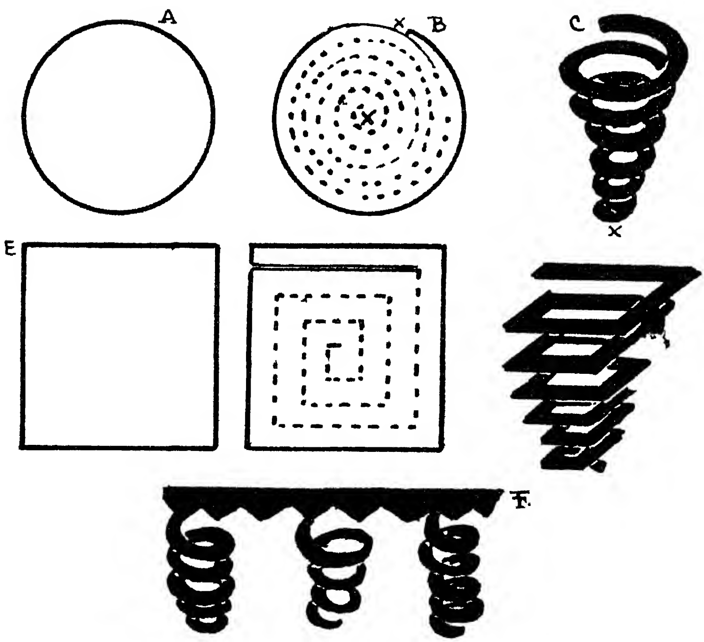


Fig. 15—Spirals

From a 6″ circle, cut from outer X mark and around and around until centre X is reached. (A and B.)

Draw the centre X outward to form a shimmering spiral. (C.)

The larger the circle used, the longer the spiral will be.

A square can be cut in the same manner. (E.)

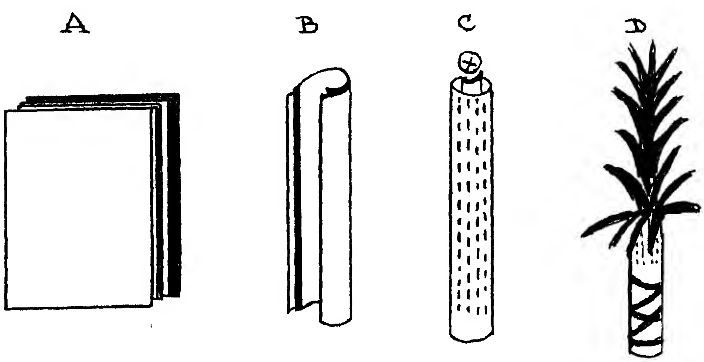
For variation, try other geometric forms—diamonds, ovals, triangles, etc.

A series of colored spirals pasted to a strip of contrasting paper will produce a border trimming attractive enough to be used in any craft room. (F.)

Spirals, when pasted to kindergarten slats and set in a box, make a gay floral arrangement for a window display. (G.)

A spiral pinned to a dowel stick set in a wooden block will whirl merrily if placed near heat or by an opened window. (H.)

Trick Tree (Fig. 16).



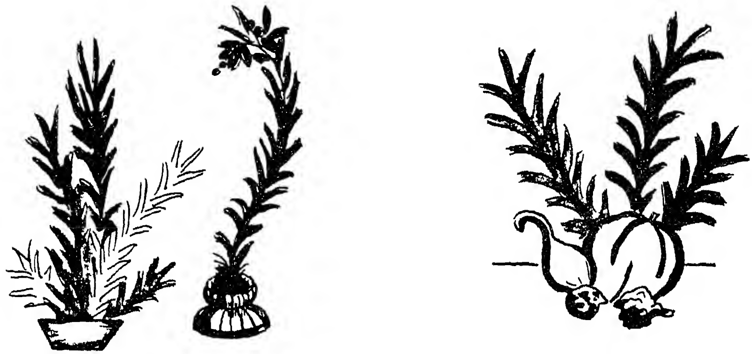


Fig. 16—Trick Tree

Six pieces of newspaper, wrapping paper, or lightweight construction paper are rolled tightly into a tube. (A and B.)

Tear or cut slashes through all thickness to within about 2″ of the bottom. (C.)

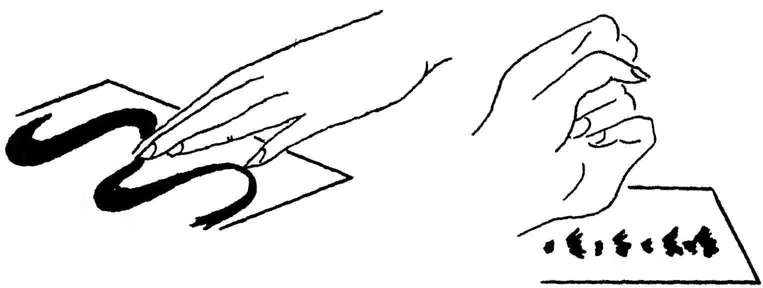
Gently pull the centre piece (X) upward, allowing the tube to turn slowly as the slashed ends emerge spiral fashion. (D.)

May be used for tree formations, shrubs, corn stalks, and room decorations.

DECORATIVE PAPER TECHNIQUES

Scrap paper, including wrapping paper, news prints, tissue, and cellophane, may be turned into useful and attractive decorative papers, taking on new life for such projects as book covers, posters, border designs, and box coverings.

Finger Painting (Fig. 17).



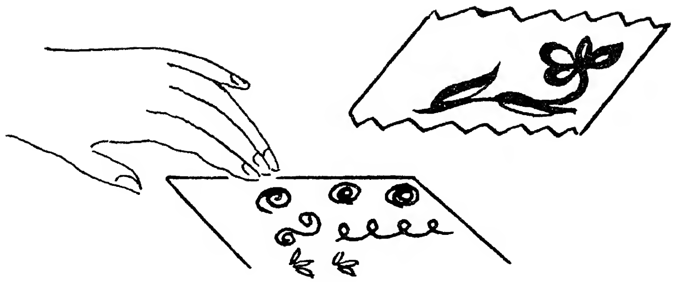


Fig. 17—Finger Painting

Materials required: glossy paper, corn starch, oilcloth mats, Shaw's Finger Paints, or tempera paints, if commercial paints are not available.

Formula for home prepared paints: Make a smooth paste using one-half cup of corn starch and one cup of cold water. Cook until mixture bubbles. Stir constantly. Cool, colour with paints, place in small jars and keep covered until ready for use.

Moisten the surface of the paper and place on an oilcloth mat.

Dab a bit of the paint on the paper.

Spread the paint over the entire surface of the paper, using the palm of the hand.

No definite motif or design is stressed. Cross hatching, plaid, and striped effects, as well as all kinds of swirls and curves, can be had. Experiment pounding with a clenched fist for bold pattern effects, or produce a feathery delicate pattern with the finger tips.

With a little creative imagination, this new medium will prove to be a means of self-expression through line mass and colour.

Fig. 18—Crinkled Paper

Materials required: light-weight paper, onion skin, tracing paper, tissue paper, transparent water colour paints, shallow pan of water, camel hair paint brush.

Submerge the paper in a pan of water, squeeze the damp paper tightly into a small wad, spread open on a flat surface.

Dab water colour paints over the surface of the paper, using a brush. When the paper has absorbed all the paint it can hold, wring out open and spread out flat to dry.

When thoroughly dry, the paper will have absorbed all of the colour in the wrinkles and creases, producing a mottled effect

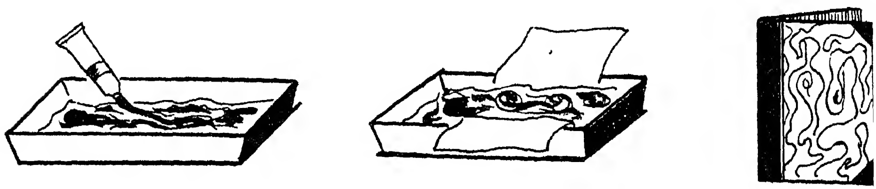


Fig. 18—Marbled Paper

The fact that water and oil do not mix is the principle of another effective means of decorating paper.

Materials required: Oil colours in tubes or printing inks, shallow pan of water, hard-sized paper, turpentine.

Mix the colors with turpentine to the consistency of thick cream.

Drop spots of colour on the surface of the water.

Work the colours into patterns by stirring gently, producing swirls or wavy lines.

Hold the paper to be marbled at opposite corners and lower it carefully onto the surface of the water, being sure that all parts of the paper come in contact with the liquid, and then allow it to dry.

The colours floating on the surface adhere to the paper, leaving a marbled effect, such as one finds on the end papers of some books.

Spatter Effects (Fig. 19).

Nature motifs from actual leaves, flowers, etc., when sprayed or spattered, make excellent greeting cards, book covers or gift papers.

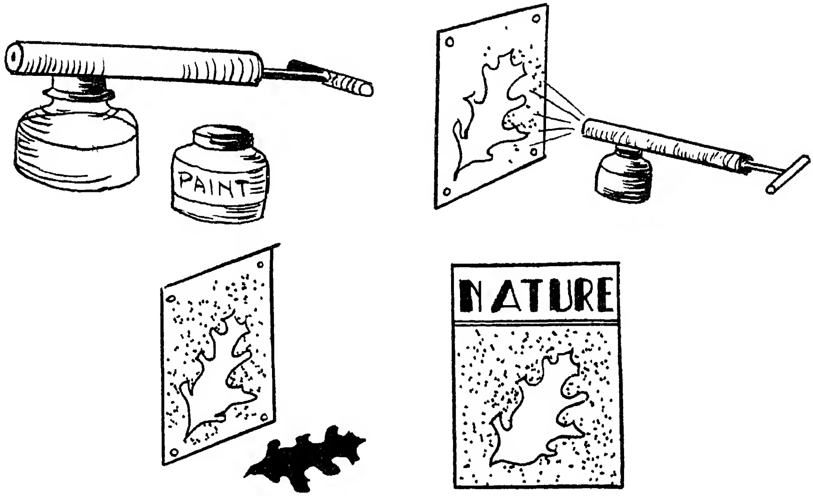


Fig. 19—Spatter Effects

Materials required. Design, tempera paints, coloured paper, flit gun, and wire screening.

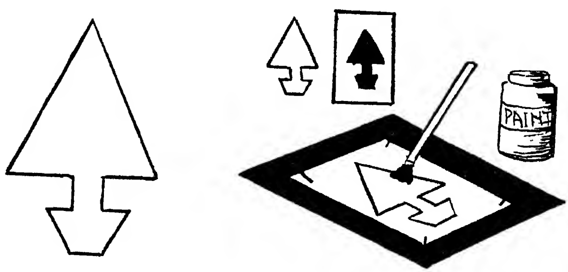
Pin the design (leaf or flower) to the paper.

Thin paint and pour into the flit gun.

Stand a few feet away from the paper and spray.

A tooth-brush dipped in tempera paint, and rubbed over a piece of wire screen is a simple form of spatter technique which can be substituted for the flit gun. Silhouettes against toned backgrounds are found when the designs are removed.

Stencils (Fig. 20).



Stencilling is a process of reproducing a design from a pattern upon another surface.

Materials required: heavy-weight paper or cardboard, stiff brush,

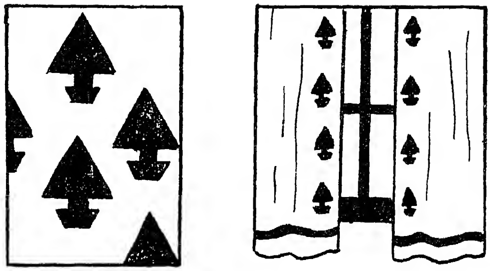


Fig. 20—Stencils

printer's ink, or oil paints for fabric use, and tempera paint for paper work

A simple motif such as illustrated in Fig. 20 can be cut on a half fold. Two or more colours may be used. For permanency in laundering, the following formula is suggested.

Formula: 3 oz. turpentine, 12 drops vinegar, 6 drops lemon extract. Mix the above formula with oil paints or printer's ink.

Tack down the paper or fabric to a hard, smooth surface

Pin stencil securely to the fabric or paper.

Apply the paint with a stiff brush to the paper or material, dabbing the brush with firm strokes, always working from the outer edges of the stencil toward the centre.

TOYS

Paper Doll (Fig. 21).

Materials required: Light-weight cardboard, paste, coloured construction paper, crayons, paints.

Cut the doll foundation from a half fold, crayon or paint in the features, and paste the two foundations together at X marks. (A.)

Apply a headdress, following instructions for curled papers under the heading Tricks with Paper.

A simple dress pattern is cut on the half fold. (B.) Cut two such patterns and join at the tab-marked shoulders, and trim the costume with coloured papers, or paint on a gay motif. (C.)

The figures may be dressed to illustrate nursery story characters, and, when placed against an appropriate background, they add colour and interest to the story hour.

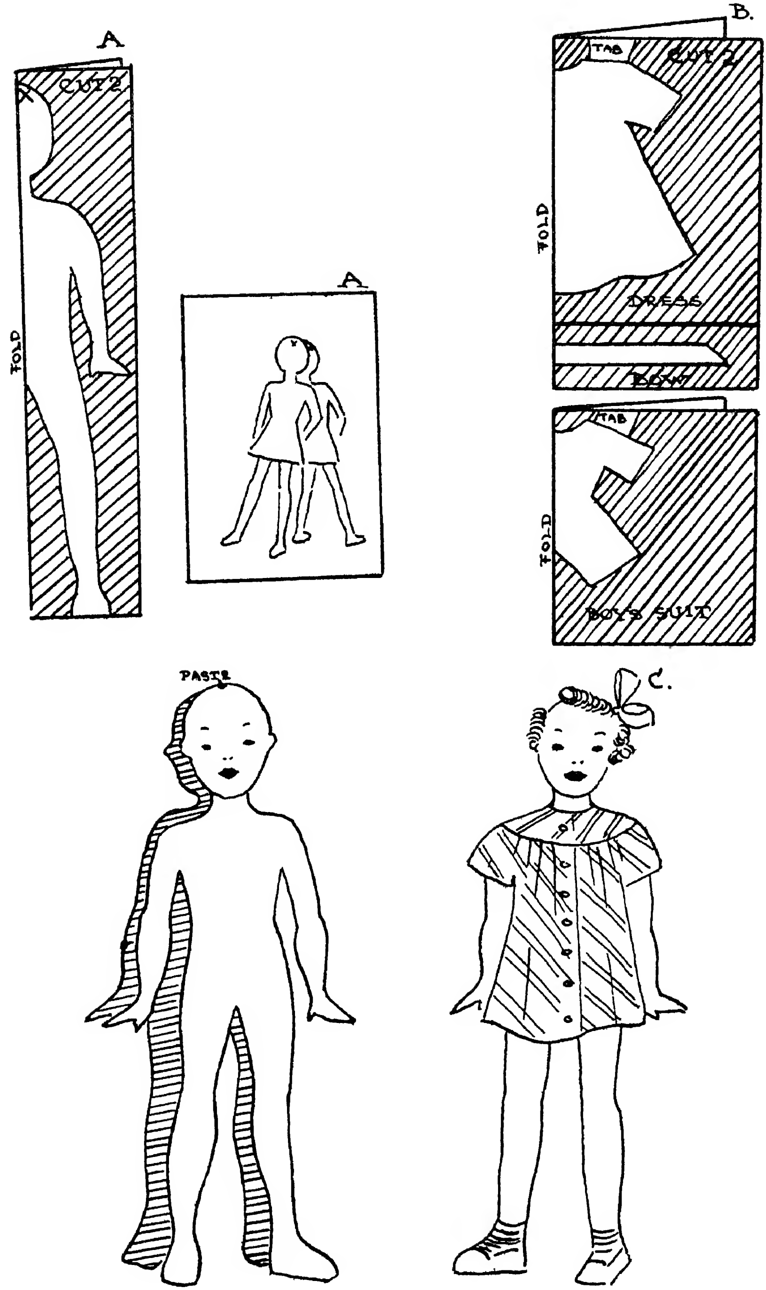
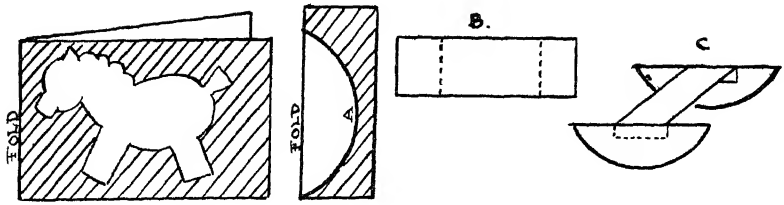


Fig. 21—Paper Doll

Hobby Horse (Fig. 22).



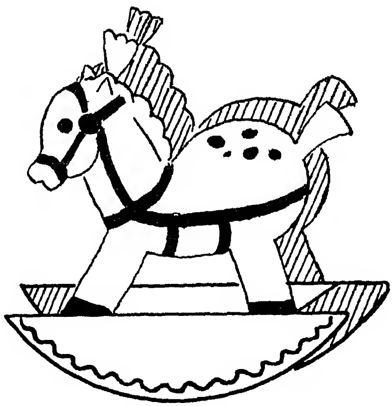


Fig. 22—Hobby Horse

Pictures of horses can be cut from magazines and pasted to cardboard foundations. For the more ambitious, simple coloured construction paper horses may be cut and decorated with bits of paper crayon or paint. (A.)

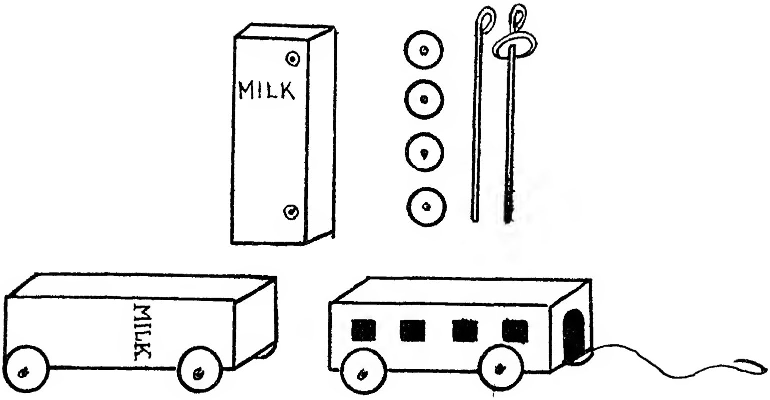
Cut two half circles from contrasting coloured paper. (A.)

Cut a strip of paper 2″ ×6″ and fold on broken lines. (B.)

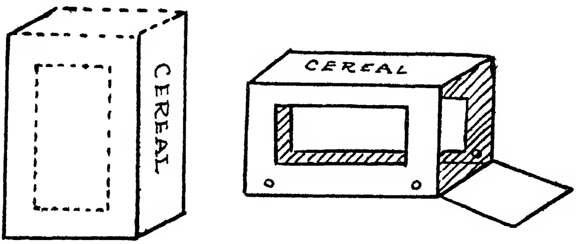
Paste the half circles to the outside of the folded strip. (C.)

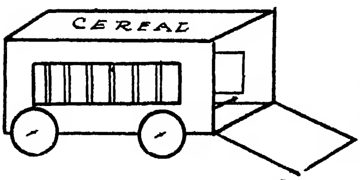
Paste the horses to both sides of the rocker and watch it gallop away.

Train (Fig. 23).



Train





Variations of Circus Wagon

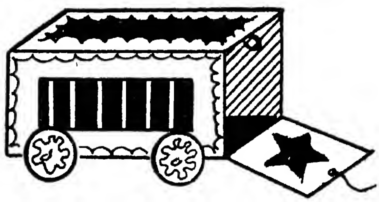


Fig. 23

Pierce holes through the container.

Insert wire through the box, attach the wheels, and secure to the box by bending the straight ends of the wire to form a loop. This will prevent the wheels from slipping off.

Paint and decorate the train. A bit of string attached to one end of the train allows for pulling or joining to a second train.

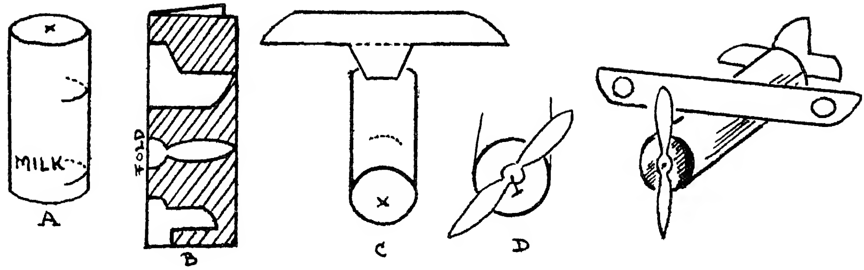
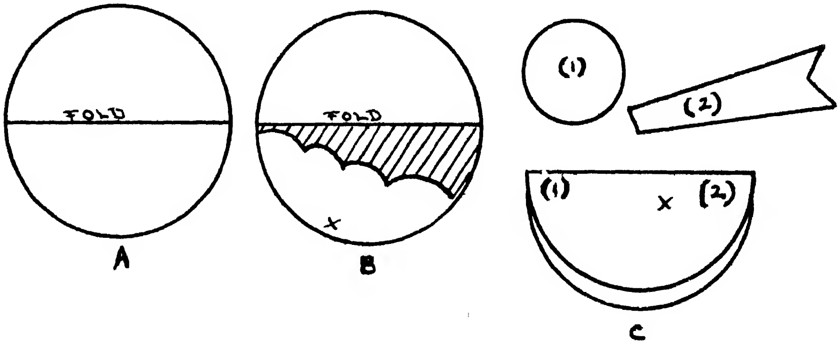


Fig. 24—Oatmeal Box Airplane

Slash on broken lines. (A.)
Cut away shaded areas for propeller wing and tail, using half fold. (B.)
Insert tail piece and wing in slashes. (C.)
Attach propeller to front of box with a pin or thumb tack. (D.)
Paint in gay colours. Twirl propeller, and send it soaring high into the air.

Room Decorations (Fig. 25 and Fig. 26).

Cut 3 circles approximately 6″ in diameter.
Fold in half. (A.)
Cut away shaded area for wing pattern. (B.)
From second circle cut a smaller circle and tail. (C—(I) and (2).)
Paste small circle (I) on (I) of folded circle. (C.) Paint or paste on the eyes and beak.



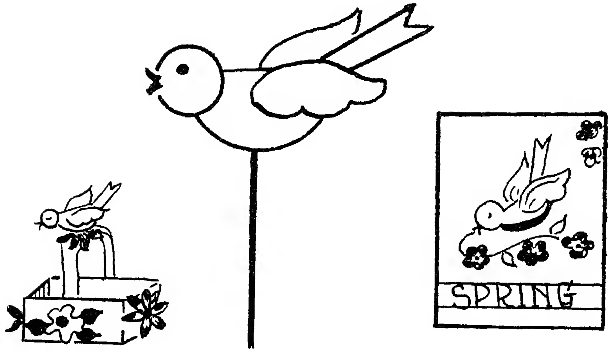


Fig. 25—Bird

The three-dimensional bird can be mounted on a kindergarten slat, and used as a flowerbox marker.

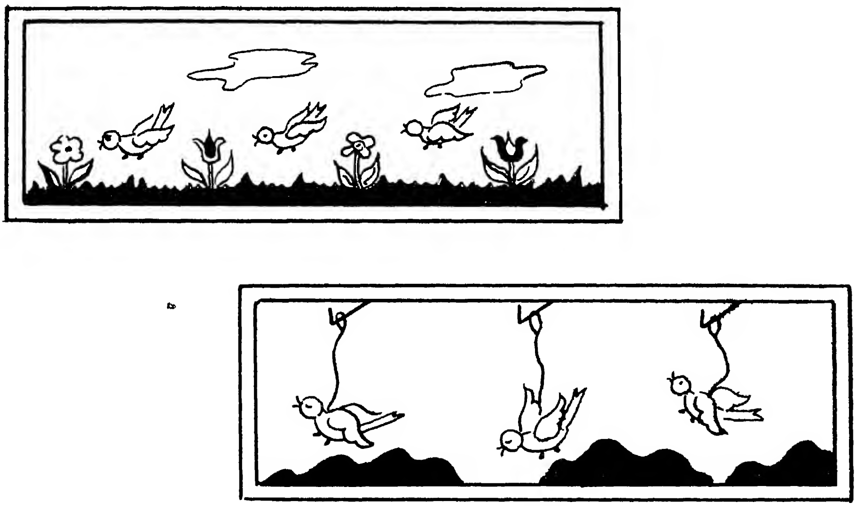


Fig. 26—Wall Decorations and Border Displays

Paste the bird on a coloured poster base for an attractive spring poster, or, for very special occasions, perch him daintily on the handle of a gay flower basket. See Fig. 26 for additional suggestions on wall decorating and border displays.

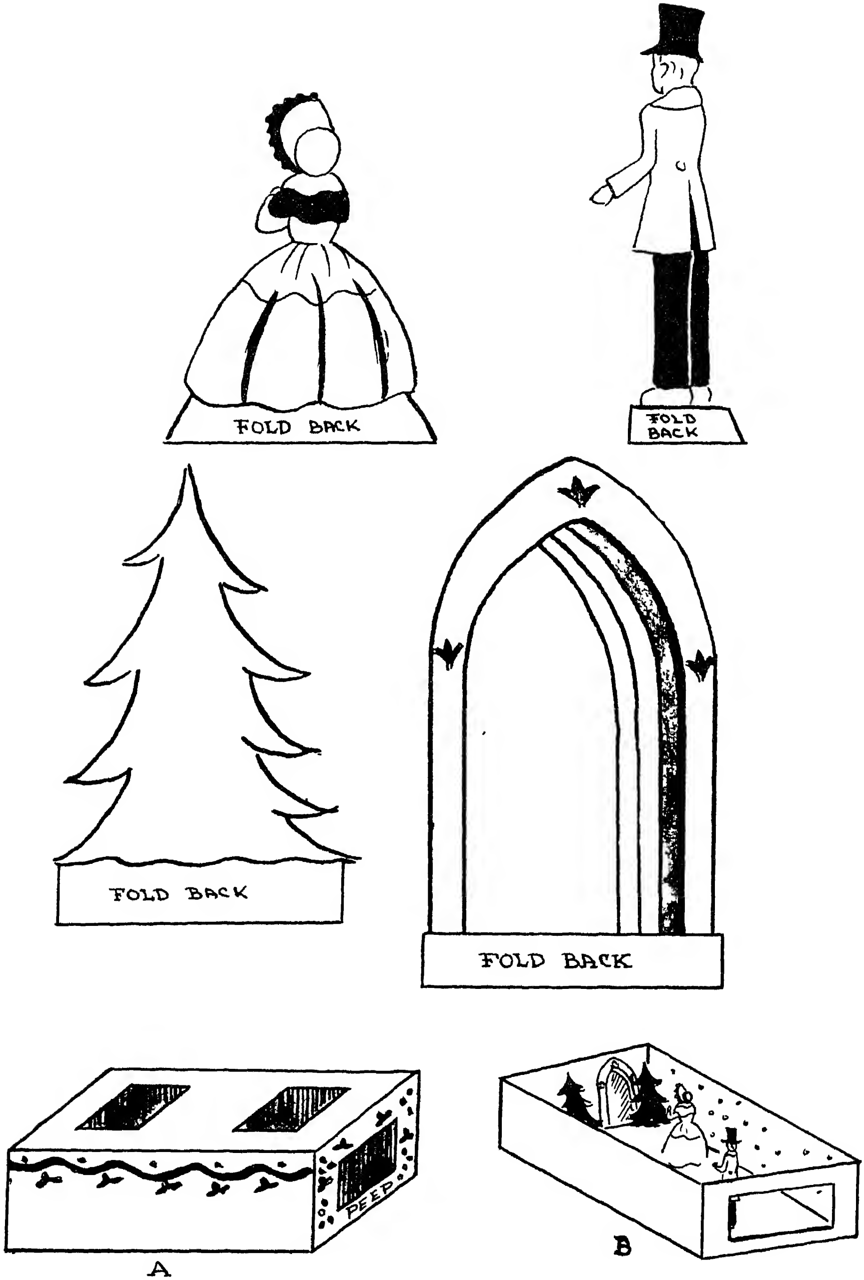


Fig. 27—Peep Box

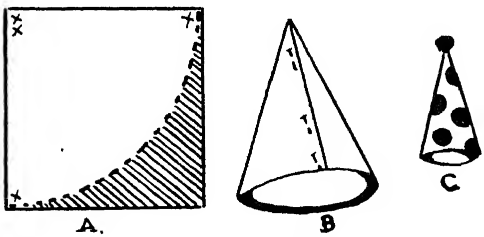
Peep Box (Fig. 27)

Mount discarded Christmas cards and coloured magazine illustrations on light-weight cardboard, allowing a bit of the cardboard to extend beneath the figures for a base.

A shoe box or deep candy box with a cover serves as the peep box. Cut away a portion of the cover to allow light to enter. Coloured cellophane pasted over the openings will produce interesting lighting effects. (A.) Cut an opening 1″ square at one end of the lower half of the box to serve as the "peep" hole.

The figures of trees, houses, etc., are placed within the box and the bases are pasted firmly to the floor of the lower half of the box. (B.) The cover may be secured to the lower part or left loose to allow for additional figures. Decorate the peep box with paints or bits of coloured papers and hold near light when viewing. Nursery characters from familiar stories are ideal for peep boxes

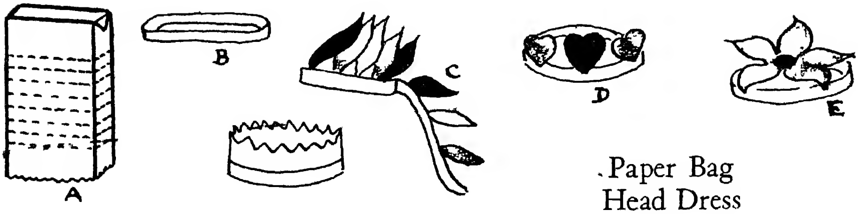
Simple Costumes (Fig. 28).



Clown's Hat

Cut away shaded area. (A.)

Paste or pin X-marked edges together to form a cone. (B.) Decorate. (C.)
Gay circles or squares pasted to the hat add colour and are fun to cut.



Paper Bag
Head Dress

Bonnet

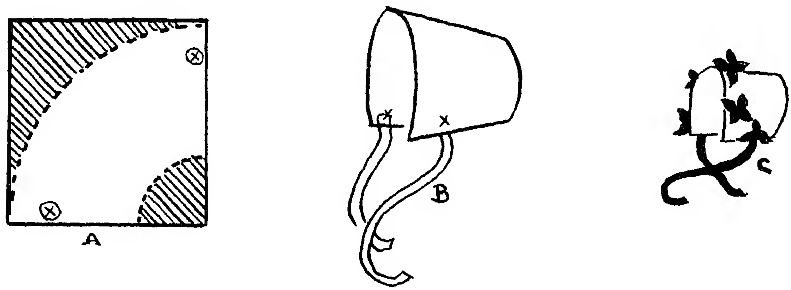
Cut through all thickness of the bag (the larger the bag the larger the headsize will be). (A.)

Cut strips about 1″ wide (B.)

Coloured paper feathers when pasted around the headband make a colourful war bonnet. (C.) A series of red hearts will please the youngest Valentine Queen. (D)

Crown the Queen of the May with a crown of garlands, cut from coloured papers and pasted to the headband. (E.)

The head sizes can be adjusted to fit with paper clips or paste.



Bonnet

Cut away shaded areas. (A.)
Punch holes in X-marked sections. (B.)
Thread with paper streamers or yarn. (B.)
Cut paper flowers for bonnet trimming. (C.)

Printing from Blocks

WOODEN BLOCKS were used thousands of years ago for the reproduction of records and for crude printing. The Chinese, master craftsmen that they have always been, perfected textile printing with the use of many blocks, often using fifty or sixty for one design. The Japanese, following along, developed stencils for printing on cloth, to a really fine art. The elaborate units of their stencils were held together with human hairs. These processes of printing, however, were far too complicated for the average person to master. It required a lifetime of application really to acquire the art of wood block engraving, printing, and stencilling, as the Orientals practised it.

Wooden blocks were used all through mediæval times in Europe for book illustration and also for textile printing. Nearly every one is familiar with Albrecht Dürer's elaborate work. He was one of the great masters of wood engraving.

During the reign of Louis XIV in France, famous blocked fabrics, imitations of which are still sold, were made in Jouy, and are known as Toile de Jouy. These show a high degree of skill, and exquisite artistry. The layman did not dabble with block printing in those days, however. The technique seemed too complicated, and the tools required were too numerous and too expensive. But since the revival of interest in handwork, these old skills are having a new day, and block printing has for some time

been on the programs of schools and recreation art groups, and has also found favor as an individual hobby

Like most of the handicrafts described in this book, block printing is a craft for people of all ages. It is very valuable as a practical application of the principles of design, if you are studying or teaching it One who has not the artistic daring to venture a composition for a formal piece of work will at least try his hand at an original pattern for a personal greeting card or a piece of fancy wrapping paper, and the principles of design and colour combinations reveal themselves gradually as one experiments.

It requires a certain amount of dexterity to carve a wooden block, but since textile printing has become a favorite hobby craft, other materials have been tried out and found practical. Linoleum, cork, soap, scrap rubber, dowels, and even potatoes and turnips can be used. After you have made a venture in this field, you will doubtless think of other everyday things that you can try out for your essays in block printing.

POTATO PRINTS

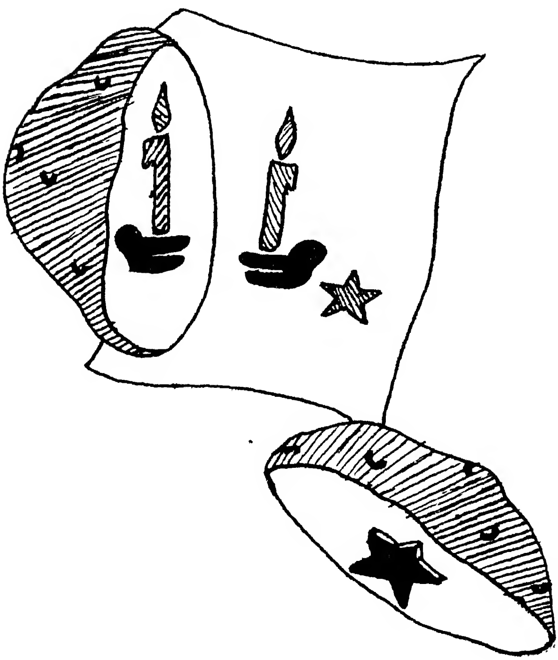


Fig. 1

Use firm potatoes without eyes, or turnips. Slice the potato or turnip in half, and draw a simple, solid design on the flat surface with a brush and water colours. The design should include the edges of the potato. Incise the outlines of the design to about one-quarter inch in depth with a small knife, and lift out the background. (Fig. 1.)

Potato printing can be done on coloured construction paper, wrapping paper, cellophane, or tissue paper, but not on cloth. Potatoes will not take printers' ink or oils.

Paint the embossed design on the potato with a brush or make a stamp pad by folding a piece of cloth or felt and spreading paint on it. Blot out the moisture as well as you can before applying the paint.

You can make your own gift wrapping papers this way, and also book and portfolio covers

A lesson in colour theory can be well illustrated with this technique—one scheme being printed with analogous colours, one with complementary, one with triads, and one monochromatic.

ERASER PRINTS, RUBBER STOPPERS, BOTTLE TOPS, AND DOWEL STICKS

Many a junk box has possibilities for printing blocks. Old sink stoppers, old erasers, cork bottle tops, and rubber heels will make a print on paper or cloth

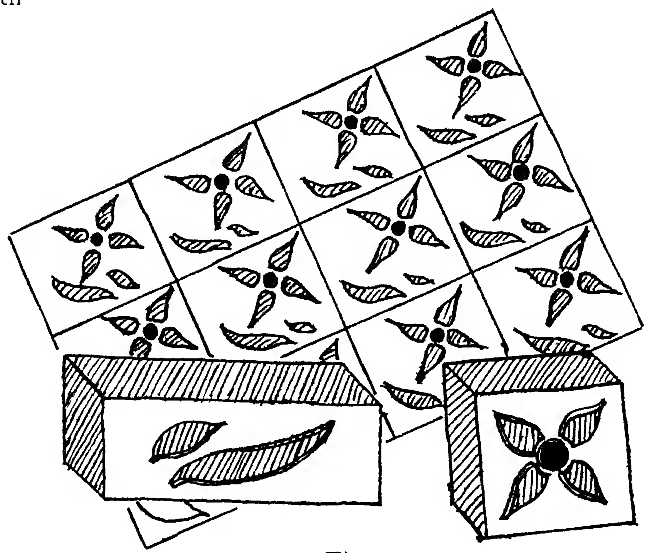


Fig. 2

Art gum erasers make good blocks. The design is scratched on the eraser with a pin, incised, and cut out. (Fig. 2.) The advantage of the eraser is that it may be used on cloth for a permanent print, being equally receptive to water colours and printers' ink. The sink stoppers, if they are flat, can have simple designs cut on them; if hollow they will print as round rings. The dowel rods can have designs cut into the ends, or large dowels with

pegs in the end can be carved and rolled over the cloth just as a rolling pin is used.

Coloured printers' ink is mixed and rolled out on a glass or marble slab with a brayer, and the ink is applied to eraser or stopper with the brayer. Pressure of the hand is heavy enough for printing with an eraser block.

INNER TUBE PRINTS

Discarded inner tubes, of whatever age or condition, can be used for printing. However, the thicker the tube, the better

Fig. 3

Make a cut paper design, either bisymmetric or asymmetric. Then trace the pieces of the design on to the piece of tubing, and cut it out with a scissors. An old rubber sink mat can also be used. Be careful not to have a seam running through any part of the design. Scallop the edges, if you like, or shape them irregularly. (Fig. 3.)

Glue the rubber design with a strong vegetable glue on to a background of cardboard or wood, with the smooth side of the tube to the surface. There should be very little wood or cardboard background, for if the edges extend they tend to print

Print this block just as you do one of linoleum. (This process is described below.) Use printers' ink. Mix it on a slab and roll it out to a thin, sticky film with a brayer, and then apply it to the block by rolling the brayer over it before each imprint. Pressure of the hand is usually enough for printing a rubber block. A mallet is not necessary.

Be sure to stretch your cloth and pin it firmly to a padded table.

STENCILLING

Stencilling is perhaps the most suitable method for children, as the technique is extremely simple and understandable, and the tools inexpensive and easily obtained.

The great advantage of this method is that a print of several colours can be made easily. A child's own painting or crayon drawing can be reproduced by stencils with all the freshness of the original, and the method is simple enough for the pre-school children as well as those in the lower grades to master and enjoy.

A chalk, water colour, or crayon sketch is made for the design. A few simple rules should be followed: Colour spots should be shown Fine detail is practically impossible for amateurs Care must be taken not to surround with a colour any area which is to be left as background, since the centre will naturally fall out A dark colour can be printed over a light one, but not a light one over a darker.

A careful tracing of the drawing is made, and the colours numbered on the tracing—one, two, three, four, or as many colours as are used. If two colours do not touch each other, they can be cut on the same stencil. A four-colour print might require only two or three stencils, depending upon the position of the colour spots.

A small, bevel-pointed knife is used for cutting stencils. A complete circuit is cut around all the traced areas on each stencil board. The cuts must be clean, so keep your knife well sharpened.

The printing is done with a fairly good grade of artists' oil paints and a stencil mordant. Mix the paint in small muffin tins or a palette. Dilute it with the mordant to the consistency of thick cream. Apply the colours to the cloth with stencil brushes (round, flat brushes). Dip the brush lightly into the colour and rub gently on a piece of felt or paper before applying to the stencil, to set the paint into the bristles. Then rub it with a circular motion over the cut-out areas of the stencil, taking care to brush *away* from the edges, and to blot. A second stencil can be placed over the first print immediately, as the mordant encourages quick drying, and the paint does not easily smudge.

Stencils can be used as second and third colours for block prints. Make the drawing for the stencil from an actual print of the block, as the block design might vary slightly in the cutting. You can use printers' ink instead of paints.

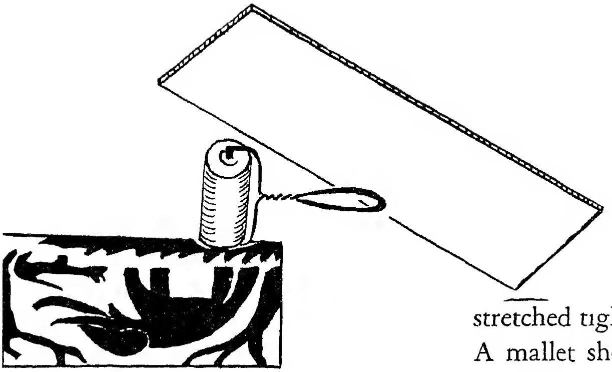


Fig. 4—Brayer

Mix the ink and apply it with a brayer in the same manner as for the inner tube block (Fig. 4.) Be sure to have the table well and smoothly padded, and the cloth stretched tightly over the padding. A mallet should be used to print a linoleum block. A few, well-administered blows are better than small taps.

LINOLEUM BLOCK PRINTING

For making linoleum blocks, the linoleum must be fresh so that it can be bent slightly with the hands without cracking. Battleship linoleum is the kind generally used for textile printing. However, there are several other varieties perfectly suitable for gouging. The linoleum should be at least one-eighth inch thick, preferably three-sixteenths to one-quarter inch. The more rubbery the linoleum the easier it is to cut. There is a very fine grade of pressed rubber sold in floor covering stores that is better than linoleum for cutting and printing. You can glue the linoleum to a block of wood or heavy cardboard, if you find it easier to work that way, or, if you like, a design can be developed on paper and transferred to the linoleum, or it can be drawn directly on the block. In any case, the block should be first coated with tempera paint, then the parts to be left raised should be painted black with a brush. (Fig. 5.) Remember that the design will print in reverse. Where the design is abstract this is not important, but it must

Fig. 5

be considered where lettering is used. For good printing results, have more black than white in the design. The white is gouged away, so all fine lines must be shown white. It is extremely difficult to reproduce a thin, black line.

Linoleum gouges are used to cut away all the white background. The outlines of the design are first cut out with a fine V-gouge. A coarse U-gouge is used to take away the large areas of white Two sizes of V-gouges and two of U are sufficient. Some artists use only a small knife, making bevelled cuts, but this method would be too difficult for children. In planning an all-over pattern, it is well not to have the edges solid—break them up with a little white. The edges are likely to print with some difference in value from one print to another.

Linoleum blocks can be developed in two or three colours. A colour design is made with all edges exactly defined, and one colour put on each block. (Fig. 6) Use as many blocks as there are colours in the design. The blocks must be cut exactly like the original design or the prints will not dovetail. There must be some guide for placement of a second or third block. The easiest way to be sure of this when a small colour spot is used is to cut the edges of the linoleum block to fit along the contour of some major part of the design.

However, when working with children, it is easier to put on second and third colours with stencils, since these require no guide in placement. Directions for stencilling are given in the preceding section.

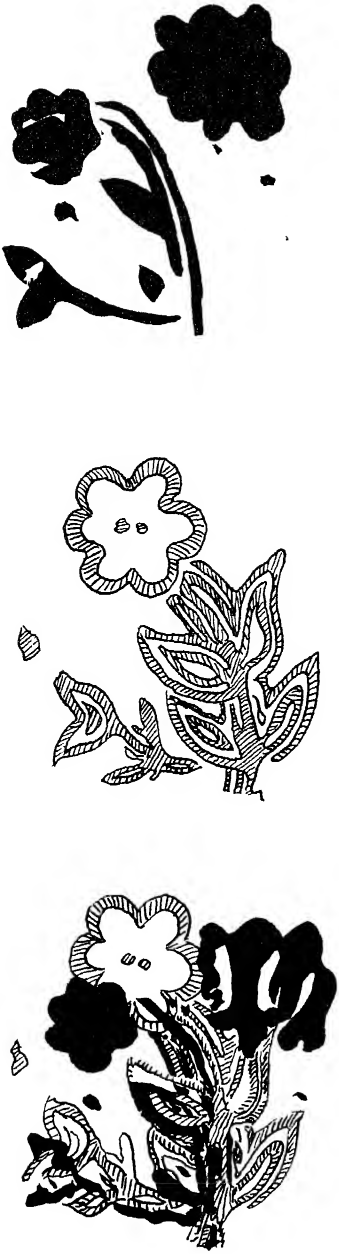


Fig. 6

ESSENTIAL TOOLS FOR PRINTING FROM BLOCKS

Brayers—Art supply stores, or improvised from smooth tubing and a package handle

Palette Knives—Art supply stores

Linoleum Block—Can be bought in sets

Cutting Tools

Printers' Ink—Art supply stores

Oil Colors—Mix with white printers' ink for body. Good grade student oil colors will do.

Linoleum—Buy remnant pieces

Glass Slabs—Buy scrap pieces from glaziers, cut to desired size

Turpentine—Paint supply stores

Unbleached Muslin—Percale, Indian head, crash, sateen, or any smooth tightly woven cotton can be used, as well as muslin. Silk is too expensive to print and tends to shift its position on the print table.

STENCILLING TOOLS AND MATERIALS

Stencil Knives—Art supply stores

Stencil Board—Art supply stores

Drawing Paper—Art supply stores

Oil Colors—Same as for block printing

Stencil Mordant—Do not attempt to buy it by name—mix it yourself. Formula: 7 parts (oz.) turpentine, 2 parts (oz.) oil of wintergreen, 1 part (oz.) acetic acid (glacial strength).

Turpentine—Paint supply stores

Oil of Wintergreen—Drug stores

Acetic Acid—Drug stores. Mix this yourself, with a small measure, a little at a time. Keep tightly corked.

Stencil Brushes—Art supply stores

Pans for Mixing—Five and ten cent stores

Paints

Unbleached Muslin—Same as for block printing. Any rough-surfaced, strong fabric will do. Burlap takes a very fine print.

SOURCE MATERIAL FOR DESIGNS

See also chapter on Design and Colour and Bibliography

The National Geographic Magazine, School Arts Magazine, and Design Magazine are excellent and can be bought at second-hand dealers. For children there are many art books for as little as ten cents which have good illustrations that can be used for suggestion and inspiration. Copying should not be permitted

CHAPTER V

The Silk Screen Printing Process

THE SILK SCREEN method of colour reproduction has been a favourite of commercial artists for years. You have seen their posters in department stores, their colourful car cards in trolleys and subways. It has been only within the past few years, however, that picture galleries and museums have given them wall space, along with etching and lithography, those more familiar and complicated methods of multiple printing. Not that it is new to fine arts. It was popular with artists in China some two thousand years ago.

Because it is such a comparatively simple process, requiring the minimum of equipment and expenditure, and because prints can be "pulled" equally well on a kitchen table as in a workshop or studio, it is admirably suited to the crafts program.

Anyone who likes working with colour will enjoy reproducing his brain children on a variety of materials including textiles, wood, paper and leather. He'll find himself making his own greeting cards, window curtains and valances, lamp shades and serving trays. Boys and girls in schools or clubs will use it for magazine covers, dance floaters and play posters. A craftsman may even find this new hobby bringing a tidy little sum, if he is fortunate enough to hit on something new and different and is lucky in his pedling.

Silk screen is basically a stencil technique. A fabric, silk or organdy—silk costs more. lasts longer, organdy is cheaper, does the trick—is stretched on a frame. A design is traced on the fabric and the backround is covered with paper, glue, shellac or lacquer. Paint is then forced through the mesh of the fabric with a squeegee. It is this forcing through of colour that gives a silk screen print its peculiar and attractive woven texture.

Any number of prints can be made. Any number of colours may be used, side by side or superimposed. Colour may be opaque or transparent, glossy or flat Methods of achieving variety with your paint will be outlined in the course of this chapter.

Your artistic talent, trained, or vaguely inherited from great aunt Sally, will be thoroughly challenged. You'll make use of all the elements of design and composition, colour harmony and colour contrast. If yours is the

"Aunt Sally" variety, you'll find endless source material in the magazines you read, the public library, the city or country life about you. The methods in this article are all adapted to use by the amateur. Should you find yourself hankering to print a masterpiece, you'll find that many of the leading art schools are now offering courses in the use of the silk screen method.

MAKING THE PRINTING FRAME

Commercial printing frames are available in some art supply shops but, because their construction is so simple, you will probably wish to make your own.

It is better to make it fairly large A frame 16″ × 20″ outside measurements, is practical. If you should wish to print a very small design, the extra space may always be masked with either paper or glue. You can use it to print a picture as large as 11″ × 17″ or as small as a postage stamp. Should you wish to print a large edition of greeting cards, you can reduce your printing time considerably by tracing your design as many times as it will fit on the screen and printing three or four simultaneously.

Materials Needed for Construction of Screen 16″ × 20″

2 pieces of knotless pine, 1″ thick, 3″ wide, 18″ long
2 pieces of knotless pine, 1″ thick, 3″ wide, 16″ long
4 flat angle irons, 3″ size
1 piece of silk or organdy, 18″ × 22″
Small flat-headed tacks
Glue
Gum paper, 2½″ wide
Finishing nails
1 pair push-pin hinges with screws
1 warp-proof drawing board, 22″ × 26″, or ¾″ plywood cut to size for printing bed
Shellac

How to Construct Your Frame

Work on a flat surface. Arrange your pieces of wood as shown in Fig. 1-A.

Put a bit of glue at each end and drive two finishing nails into each corner. Reinforce all corners with angle irons, making certain, as you go

along, that your surface remains perfectly even. If it isn't even, your frame will not be level and you'll find yourself in real trouble. (See Figs. 1-A, B, C, and D for different ways of nailing the frame together)

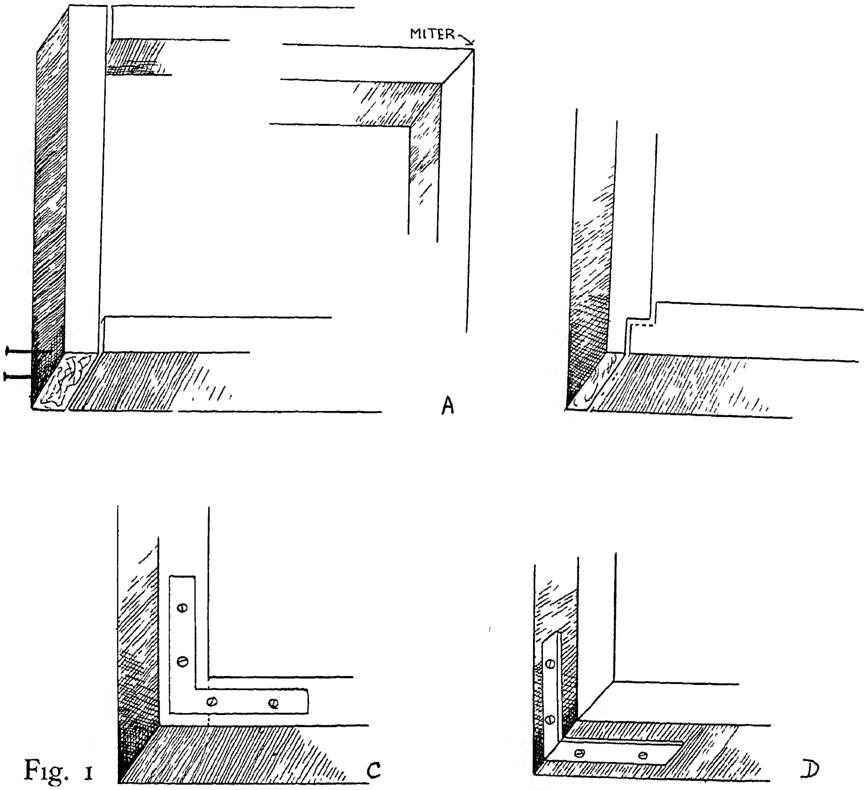


Fig. 1

The silk used for silk screen printing is called bolting cloth and is extremely durable. It comes in meshes 16XX, which is extra fine, to 6XX which is coarse. 10 XX or 12 XX is advisable for general use.

When you are ready to attach the silk or organdy to the frame, centre it over the top side of the frame (not the side with the angle irons), keep your mesh running parallel with the frame, and put in your first four tacks at points A, B, C, and D. (Fig. 2.) Now choose one side (we'll say A) and put in tacks, alternating left and right, about 1″ apart and working out from the centre. Keep fabric taut and avoid all wrinkles. Drive your tacks so that they are flat with the wood. Now repeat on side B, then C, and D.

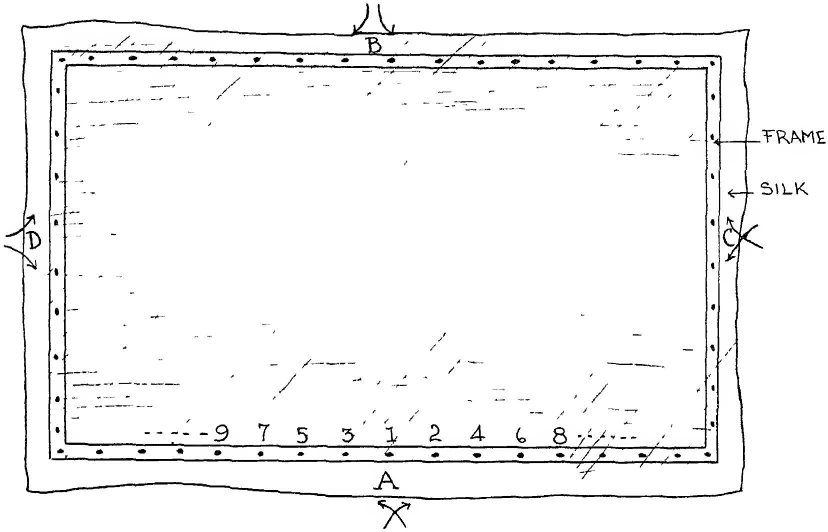


Fig. 2—Applying Silk to Frame

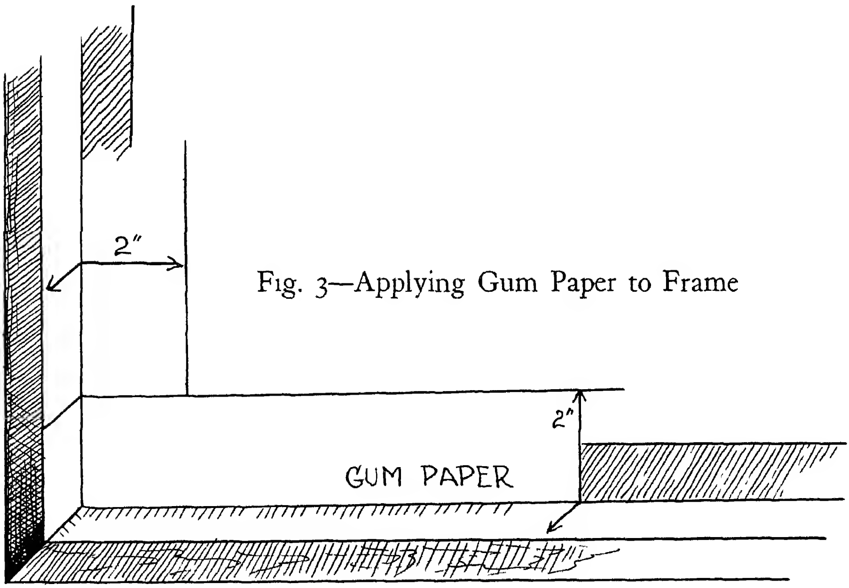


Fig. 3—Applying Gum Paper to Frame

Glue the extending silk to the outer side of the frame and secure it with a few tacks.

Take a piece of gum paper 2½″ in width. Run it along so that it covers

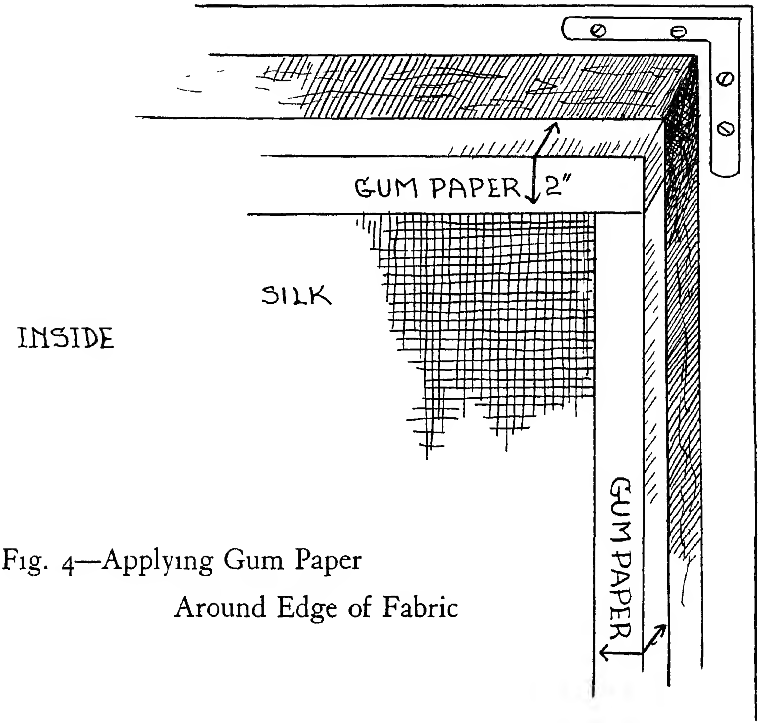


Fig. 4—Applying Gum Paper Around Edge of Fabric

the top surface of the wooden frame and extends 1" onto the fabric. (Fig. 3.) The extra ½" fold down over the outer edge of the frame. Turn over the frame and run another 1" wide strip around the edge of the fabric. (Fig. 4.) You will now have two 1" wide thicknesses of paper reinforcing the outer edges of your screen, one above and one below. These will serve to keep the paint and cleansing liquids from seeping through the tack holes. You can shellac the paper strips after twenty-four hours, making them even more durable and water-repellent.

During the printing process, your paper is slipped between the screen and an attached board which is known as a printing bed. This should be ¾" plywood or a good commercial drawing board. For our frame it should be about 22" × 26".

Centre your silk screen on the board, fabric side down. Fasten your push-pin hinges on a long side as illustrated. (Fig. 5.) A flat stick, about 6" long and 1" wide should be screwed loosely to one of the short sides. This will act as a support for the frame during the insertion and withdrawal of paper during the printing process. (Fig. 6.)

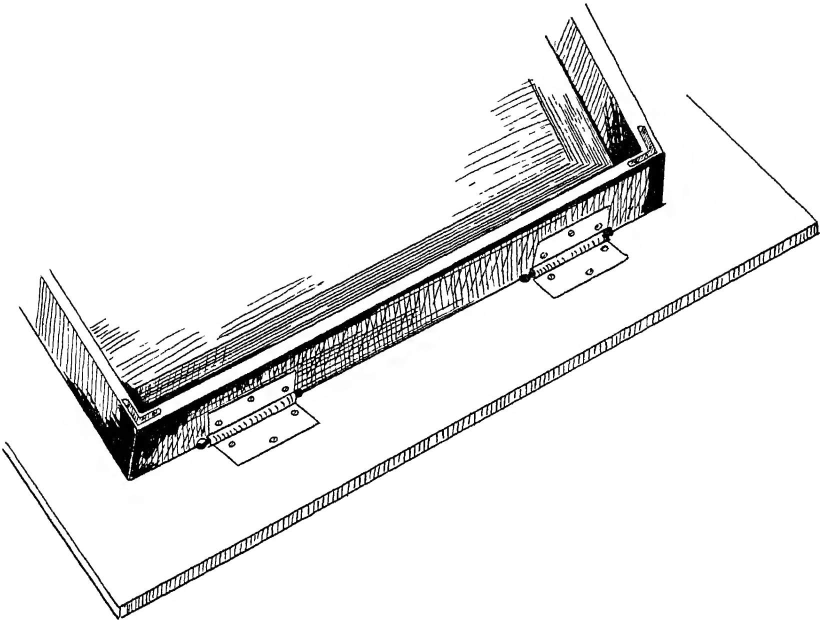


Fig. 5—How to Fasten Printing Frame to Printing Board or Bed

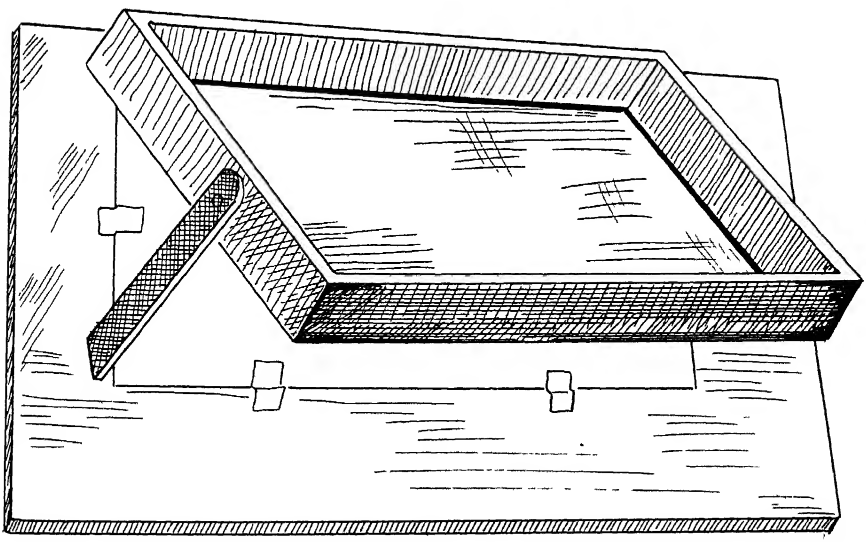


Fig. 6—Silk Screen Ready to Use

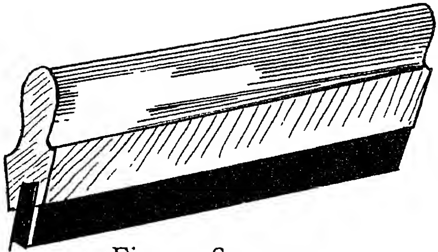


Fig. 7—Squeegee

A good squeegee is important to the making of good prints (Fig. 7.) It must be sturdy in order to press the colour through the mesh. A sharp squeegee will give a clean, definite printing quality. Equip yourself with a good commercial squeegee. At present they cost 10¢ the running inch. One 10″ wide would be good for use with our frame. The care of the squeegee is simple. Cleanse it with kerosene after using it with oil paint, and with water after water colour.

Colours and Mediums

Silk screen colours, called process colours, are available in quart and gallon cans in a paste-like form. The oil colours are all opaque, and dry flat in about one-half hour. You can choose from about twenty-five different colours.

The qualities of the colours are such that they are opaque when overlaid. To make your colours transparent, a transparent base is mixed thoroughly with the paint, in quantities depending on the effect desired. The resulting transparency is often used for skies or flesh tones.

When a glossy varnish is used as a medium, your print will dry shiny.

For printing on absorbent surfaces, such as soft cardboard, wood, or felt, it is necessary to use your colours in a much thinner solution than when you are printing on a hard, shiny material, i.e., glass, metal, oilcloth, etc.

There is a high-gloss process lacquer which is very flexible and durable. It is especially useful for textiles, as it may be washed, and also for outdoor signs which must stand up under wind and high weather.

There is a wide choice of bronzes in different shades to liven your signs, and greeting cards, and a really remarkable product called a "rayon flock" which will lend your printing the effects of velvet, velour, or suède.

PRINTING FROM A PAPER STENCIL

One Colour

To make a one-colour stencil print, the following materials are necessary: design or silhouette, cutting knife, paper for printing, can of kerosene—

pint or quart can, tracing paper, colour mixed with base, roll of gum paper, old newspapers and rags.

Now let's assume that you have made a design for a Christmas card. You may print a light colour over a dark paper or a dark colour over a light paper

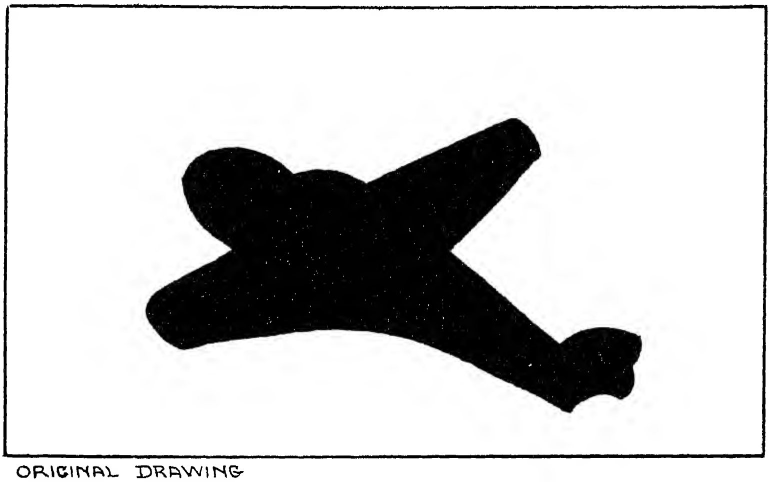


Fig. 8

Mount your drawing on a smooth piece of cardboard. (Fig. 8.)

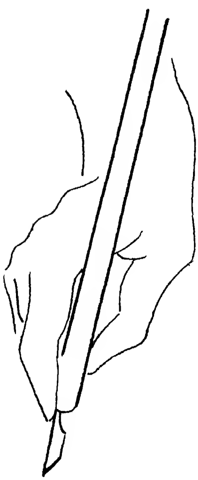


Fig. 9—
Cutting Knife

Over it lay a stout piece of tracing paper, somewhat smaller than your drawing sheet, but ample enough to cover the entire design. Fasten this with small pieces of gum paper in order to secure a flat, stationary surface. Now proceed to cut with the cutting knife all along your outline. (Fig. 9.) It may be difficult, at first, to cut a clean line, but if you have a sharp knife and hold it almost perpendicularly, you'll soon master the skill

(Fig. 10.) It is only necessary to cut through the tracing paper

Once the stencil is cut, lift both sheets (the mounted drawing and the tracing paper, still secured by the gum strips) and place them carefully, tracing paper up, on the drawing bed. The gum strips may now be removed but be sure that the tracing paper stays in the position desired for

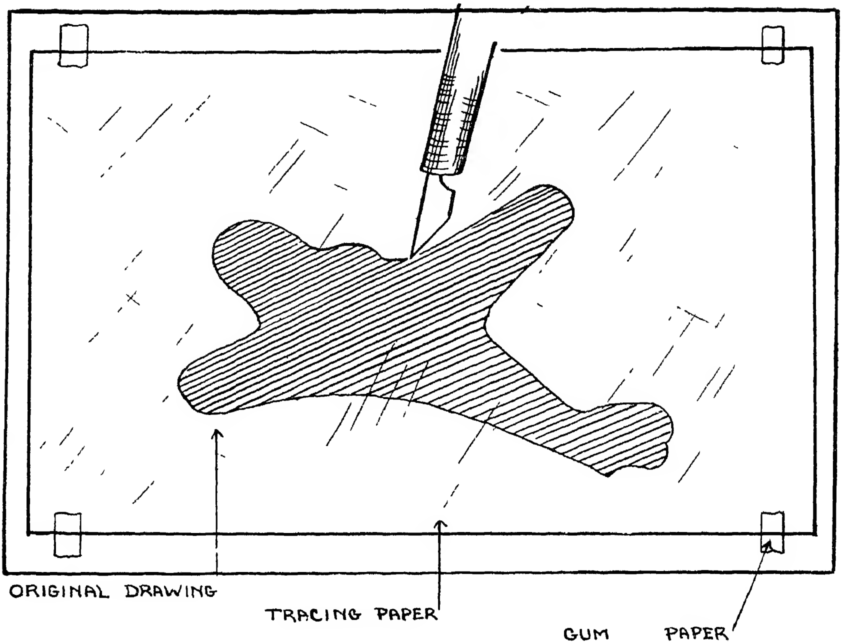


Fig. 10—Cutting

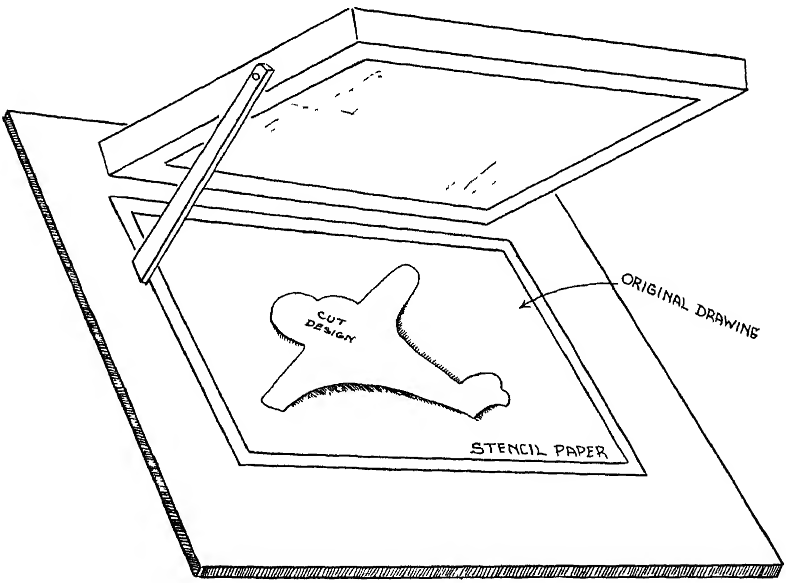


Fig. 11—Frame Ready to Be Lowered into Place

printing. Now lower the frame into place. (Fig. 11.)

Pour about two tablespoonfuls of your prepared colour on top, somewhat to one side, of the silk screen. With your squeegee pressed down on the silk, move the whole amount of colour across the surface of the silk. (Fig 12.) The paint at this time will act as an adhesive and glue your stencil to the under side of the silk. Now carefully lift up the screen and separate it from the printing bed by removing the pins from their hinges. To be sure that your stencil will continue to adhere to the screen, run another strip of gum paper all around it, attaching it to the frame. (Fig. 13.) Remove your design, being careful that the cut edges of your stencil are fastened to the silk. Put your frame back into its hinges.

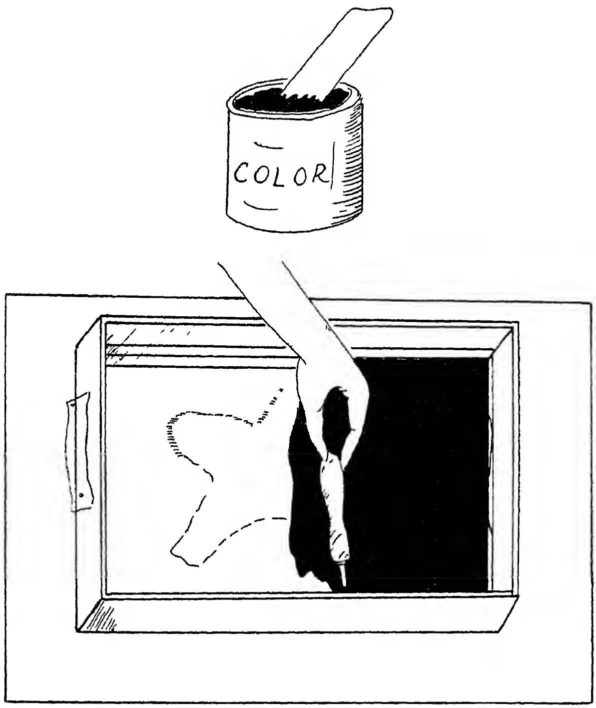


Fig. 12—Applying Colour

You can now put in your guide marks. Lay a piece of your printing paper, which, it is assumed, has all been cut the same size, in the desired position. Fasten three guide marks on the surface of the printing bed. (Fig. 14.)

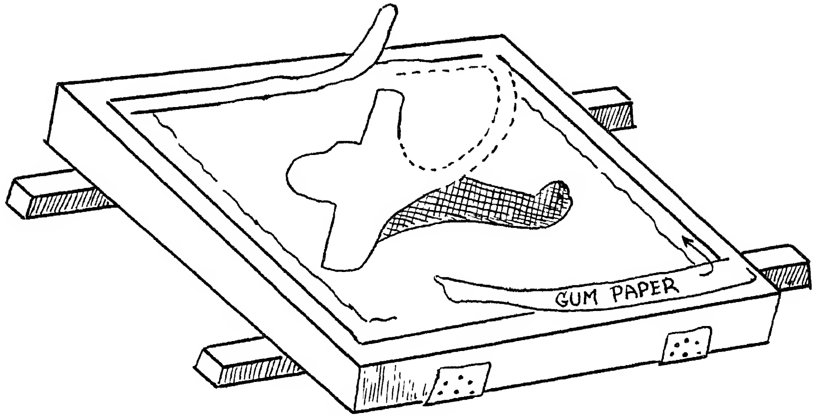


Fig. 13—Applying Gummed Paper Around Stencil

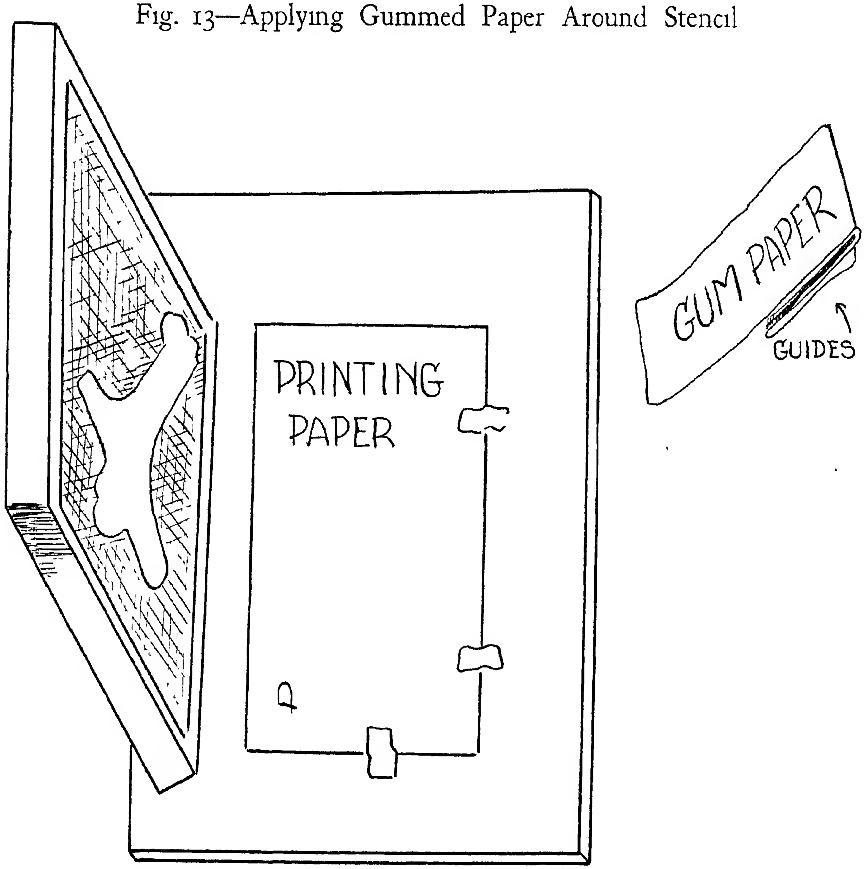


Fig. 14—Guide Marks on Surface of Printing Bed

Here's the big moment! You are ready to print. Fit a piece of paper into the guide marks on the printing bed. Lower your frame. Pour your colour onto the screen and squeegee it across the surface of the silk with a firm hand. Any excess colour which clings to the rubber of the squeegee may be scraped off and used again. Scrape off with a small stick directly back into the printing frame. Lift up frame, remove print and lay aside for drying. (Fig. 15.) Now go ahead and print your edition. Be sure not to pile your wet prints on top of each other. If you haven't a drying rack, spread them about the room, one deep When you've finished printing, scoop up any colour remaining on your screen and put it back into a jar. This can be kept for sometime by first covering it with a wet rag and then closing it with a tight cover

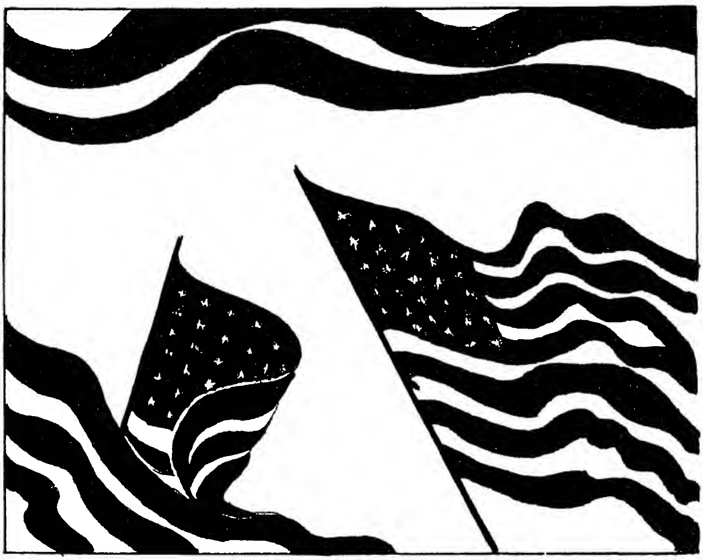


Fig. 15—A Finished Print

Take the pins out of the hinges. Peel off all your gum strips and your stencil. Now spread out several thicknesses of newspaper to protect your working surface and to soak up excess kerosene. Put your screen, silk side down, on the papers, and wash out all colours from both sides (you'll have to turn it) with a rag soaked in kerosene. Work until the silk mesh is clean and entirely free from paint. It's much easier now than after the paint has had time to harden.

THE BLOCK OUT METHOD

(More Than One Colour)

For more varied effects in your printing, the block out method is recommended. With it, the artist may use his brush for a solid line or to stipple. He can introduce spatterwork or use a sponge to achieve interesting textures in his work. Always remember that the final print will reproduce exactly as the design has been drawn on the silk

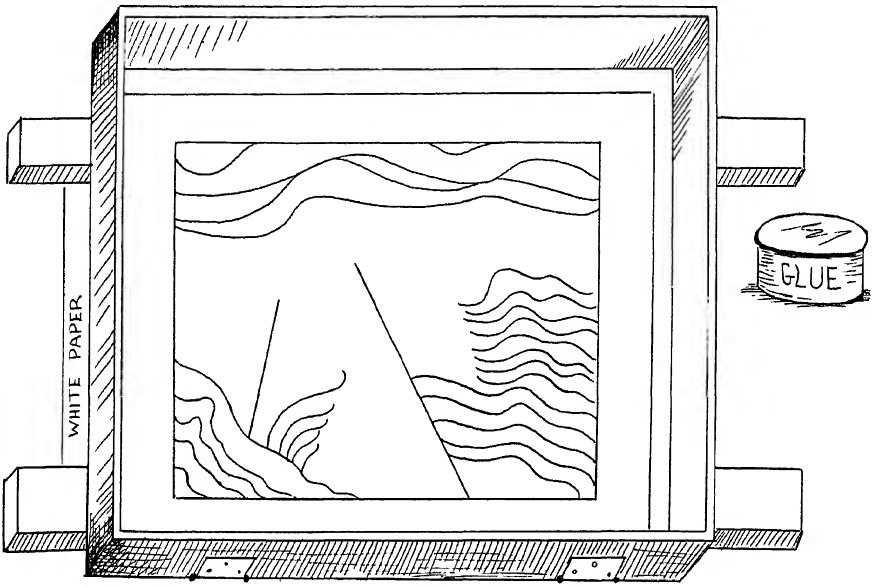


Fig. 16—Original Drawing Placed Under Screen. Outline on Silk All Masses in Red with Soft Pencil.

For our purpose, we'll suppose you wish to make a print in two colours—red and blue on white paper. Any number of colours may actually be used As a drawing medium we'll use glue. (You could use shellac instead.) You'll find that the glue will show up more clearly if a little water colour is put with it. Any good ready-mixed glue will serve our purpose. If you should be using shellac, mix it with a little dye instead of water colour. Each mark of the medium on the screen will hold back the colour. Therefore, your printed design will be whatever you have left untouched on your silk.

Place your original drawing on the printing bed and fix your guide marks. (Fig. 16) Lower your screen and trace all your red masses onto

the silk, using a soft pencil. (Fig. 17.) Remove the screen from the printing bed. Prop it up on books or blocks until it is 1" or 2" above the working surface Insert a piece of white paper under the screen so that the tracing

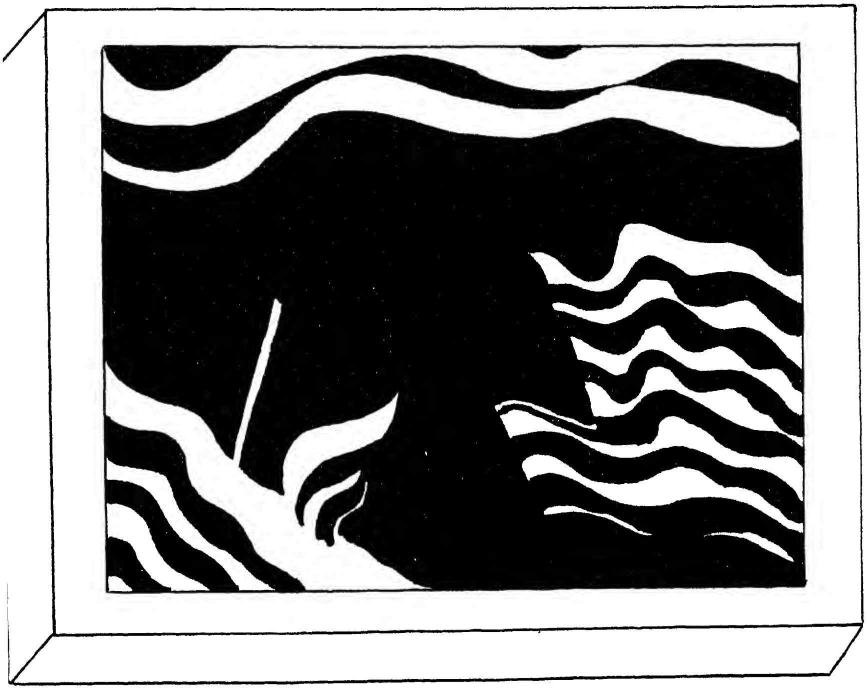


Fig. 17—Red Masses Traced Onto Silk

may be seen more easily. Now take a brush and fill in with glue (or shellac) all the areas that are to print either white or blue. When this is thoroughly dry, you are ready to print your first colour, in this instance, red. Follow the directions given in "Printing from a Paper Stencil," and print the red areas of your entire edition. When you have finished, wash out glue with warm water. If you've used shellac, clean with alcohol. Now repeat the process with your blue masses. Be sure to keep your printing sheets within the limits of your guide marks. (Fig. 17)

THE TUSCHE METHOD

(Many Colours)

Most of the silk screen prints you may see in shops or in art galleries have been made with this completely adaptable method. Any number of colours

may be used, and prints have been made by the artist using as many as twenty-two different shades, which meant that he had to go through twenty-two separate printing operations to achieve the result. Of course, you can use a much more limited colour scheme and produce really striking effects. In fact, because of its flexibility, this method can be made to reproduce anything from a line drawing to an oil painting.

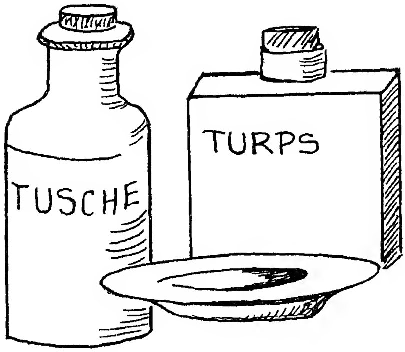


Fig. 18

Tusche, itself, is a liquid which may be purchased in bottles from any lithographic supply store. When you are ready to use it, pour a small quantity into a saucer and thin it slightly with turpentine. (Fig. 18.) You will apply it with a brush, suitable in size, to your sketch.

Let's assume that you have made your preparatory sketch and are planning to print it in five colours. (Fig. 19.)

Place your drawing on the printing bed. Establish your guide marks. Lower the silk screen into position and trace with a soft pencil all the areas containing your first colour, say light blue. (Fig. 20.) Now you're ready to apply your tusche. Remove the screen from the hinges, and, with a full brush of tusche, cover all areas you have marked. Wherever a different texture is desired, stippling, sponging, or spattering, it may be introduced. Allow the tusche to stand for about half an hour. It will never seem really dry but it will set.

Thin down half a glass of LePage's glue with water until its consistency is that of cream. Pour onto the silk enough of this to cover the entire screen, and, with a piece of stiff cardboard, used as you would a squeegee, cover the whole silk area, including, of course, the tusche drawing. (Fig. 21.) The excess glue may be scooped up and put back into your glass. Examine your silk carefully to be certain that all the mesh is filled in by the glue.

Fig. 19—Original Drawing

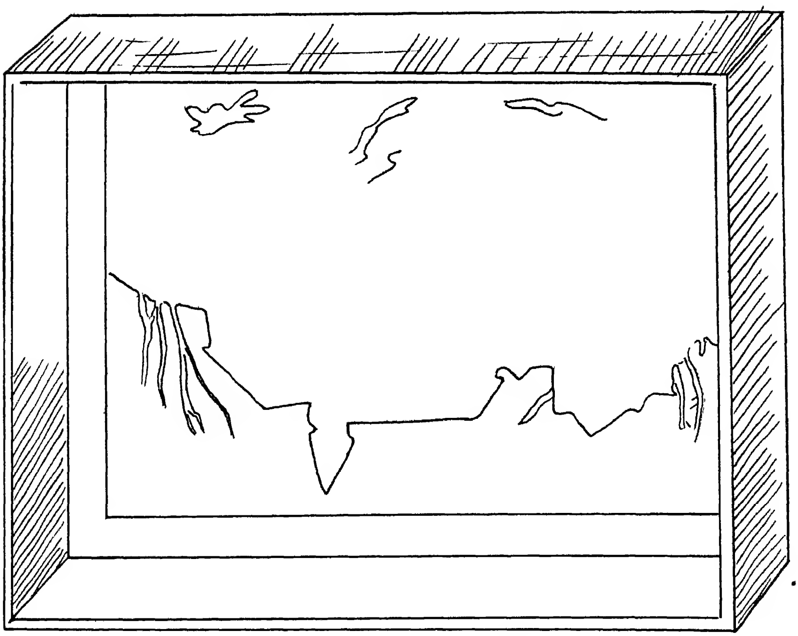


Fig. 20—Place Under Screen. Fix Print Guides and Trace Outline of Sky and Other Light Blue Areas with Tusche

If it isn't now is the time to go over the screen with a second glue coat. If you should slip up and find that during your printing some of the mesh isn't completely covered, you will have to stop and go over all leaky places with a brush full of glue.

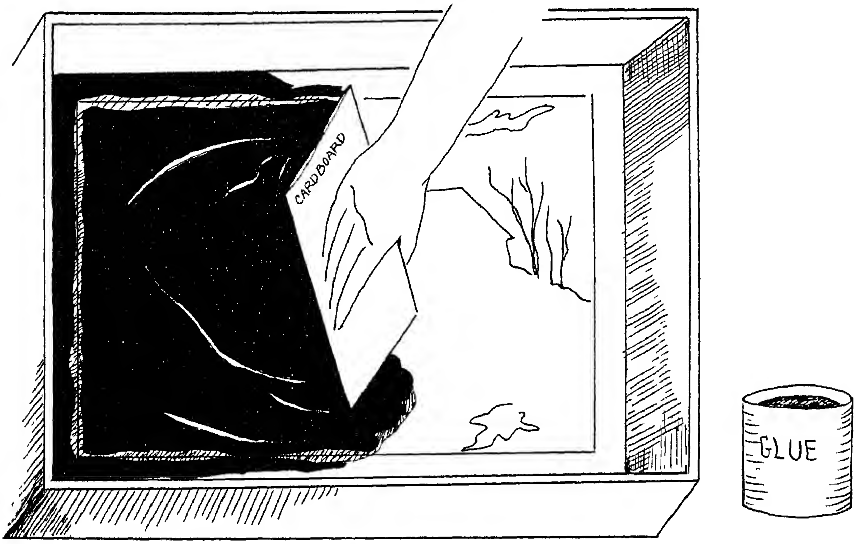


Fig. 21—Cover Complete Screen with Le Page's Glue

The glue will dry in from thirty to sixty minutes, depending on the atmosphere. Be sure to wait until it is really dry.

Spread several layers of newspapers on your working table. Lay your screen on top of them. We're going to remove the tusche. Take a rag or sponge soaked in kerosene and rub vigorously on both sides of the silk. (Fig. 22.) You may find it necessary to use an old soft tooth brush. Rub until all the tusche has disappeared and your design is transparent against the glue. The glue will not be affected by the kerosene. Now you are ready to print your light blue areas. Proceed with the printing method already outlined.

After you've gone through an edition with your first colour, use lukewarm water to remove all glue from the screen, first removing screen from the printing bed. Wipe both sides of your silk with a dry cloth. Attach again to printing bed and proceed to trace your next colour areas from the original drawing. (Fig. 23.) This procedure is repeated until all colours are printed. If you should make a mistake while drawing with tusche, just apply some kerosene with a brush and dissolve the unwanted lines or masses.

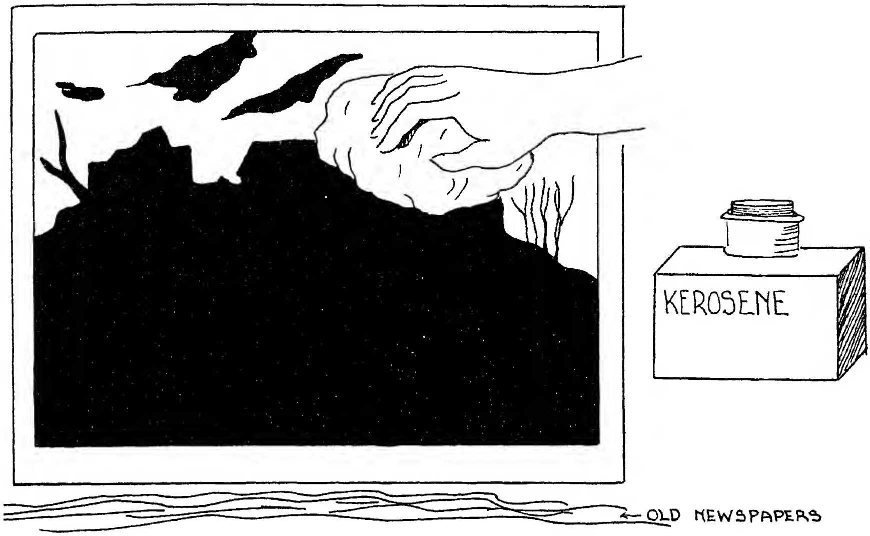


Fig. 22—Removing Tusche with Kerosene

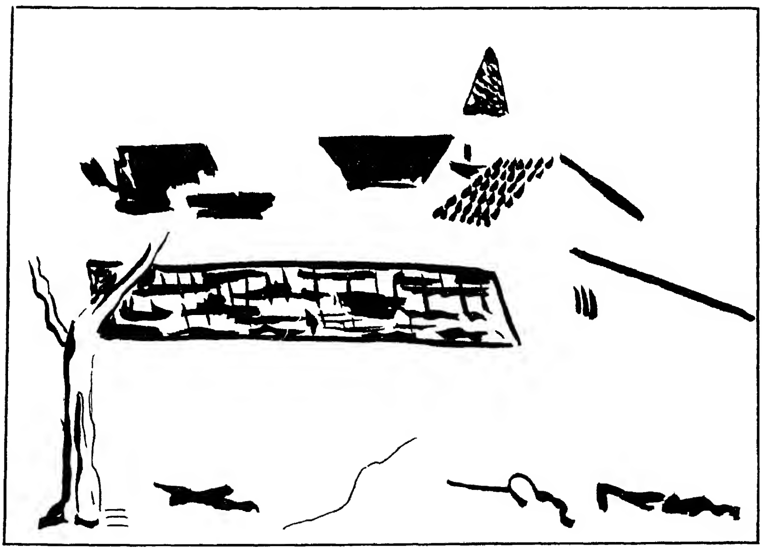


Fig. 23—Your Second Block Out Drawing (Colour Red)

CHAPTER VI

A Hand Printing Press

PRINTING, although an art in its own right, has never existed for itself alone, but as a medium for recording and preserving other arts.

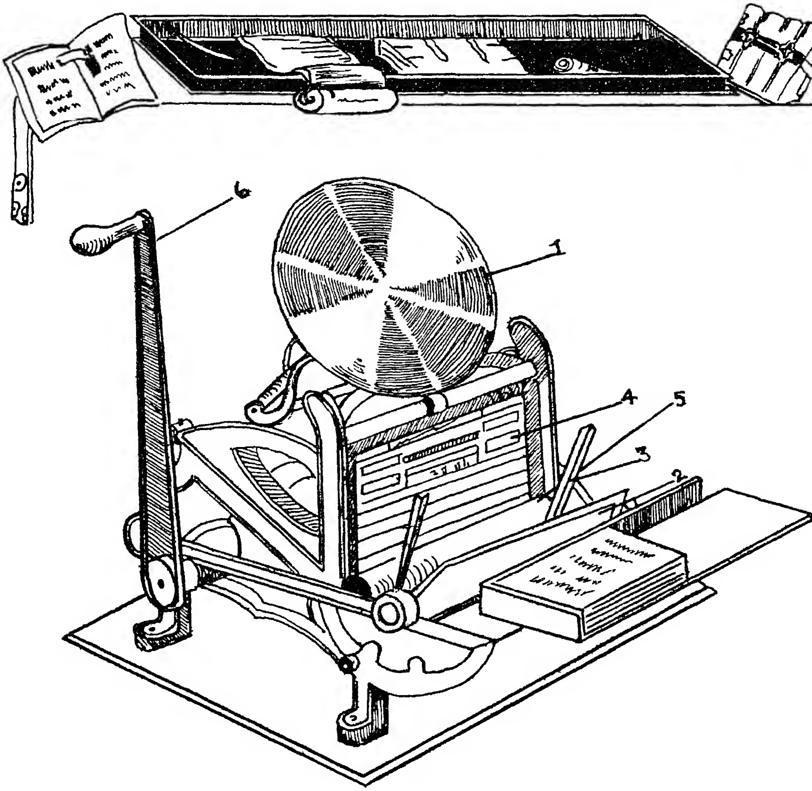
A printing press is far more than a device for impressing words and pictures upon paper. It is one of the great symbols of the liberation of man. The discovery and practice of letter press printing in fifteenth century Europe, and the consequent spread of the ideas which finally broke down the walls of mediævalism, were the chief factors in extending to the humble majority opportunities which had before been reserved for only a select few.

A hand press, therefore, however small, is a link with a noble tradition, and the phrase "freedom of the press" takes on new shades of meaning when we think of the tremendous issues involved in its invention.

Printing, as well as being a fine art, is a craft requiring high skill. The amateur printer can have the satisfaction of exercising his taste and his creative faculty and also of acquiring manual and mechanical adeptness.

The large letter P at the beginning of this page is called an illuminated letter. Early hand-made books had these letters at the beginning of pages and paragraphs. When printing by press came in, space was left for these initials to be drawn in and coloured by hand. The artists, or rubricators, as they were called, were for the most part illiterate, and that is why, frequently, beautiful letters appear out of place in the old manuscripts. Drawing at foot of the page is an early printer's mark.

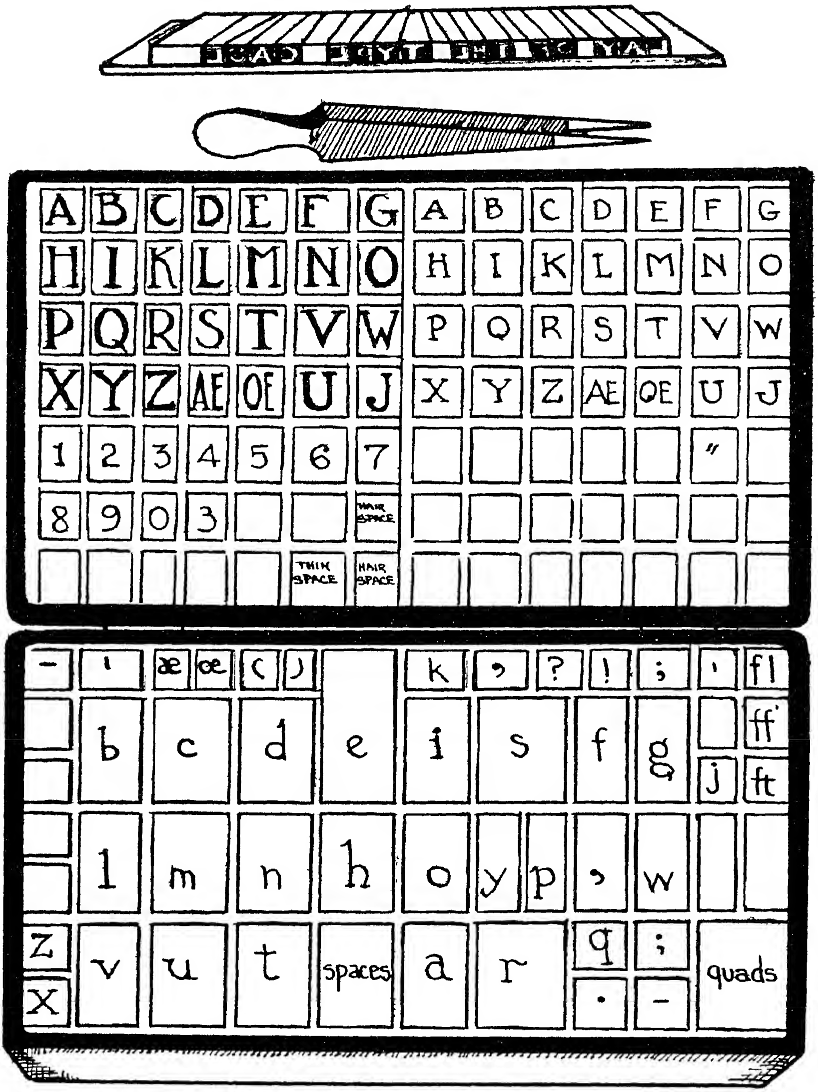
At the end of this chapter is a brief sketch of the story of printing. There you will find the steps that led to the first hand press.



A Press: This may be one of three kinds. It will likely be a platen or bed type, but may be the cylinder type. The platen press is most commonly referred to in this book

THE PRESS

1. INKING TABLE
2. PLATEN
3. GRIPPER PINS
4. CHASE
5. ROLLERS
6. HAND LEVER



There are several fonts of type of various sizes. It is desirable to have three or four kinds to begin. Leads and slugs of various lengths are essential. You will also need reglets and furniture, leads, quoins and a key, two chases, printer's ink in two or three colours, paper, rags and cleaner, a composing stick, copy, type cases, a galley, a high table for setting type, a lower table for the press, newspapers for slip sheets, a dictionary, a grammar book, a good light.

Measuring Type

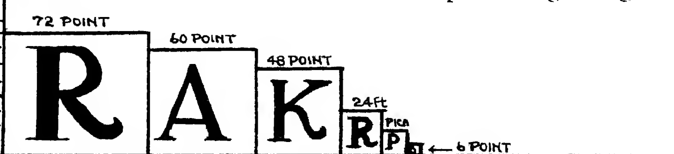
In the early years of printing there was no uniformity about the size of the letters used. Each man made his own, so it didn't matter As printing advanced it became necessary to set some rule by which the body could be measured In America this has been accomplished by an agreement among the type founders to adopt one standard, called pica, and to divide that pica (or body) into twelve points. The point is the unit on which the system is based. There are approximately seventy-two points to an inch.

Standard type sizes are· 6 point, 8 point, 10 point, 12 point, 14 point, and up to 72 point

Lay of the type case

When the type comes from the foundry it is in packages with all of the types of one character together. For convenience, they are placed in the type case which is divided into compartments for each character.

The compartments vary in size to accommodate the number of sorts of each character, and they in turn are placed at points in the tray which make them most easily available to the compositor or the setter. Certain letters occur more frequently than others and there are always more "e's" and "t's," for instance, than other letters. There is much difference of opinion regarding the

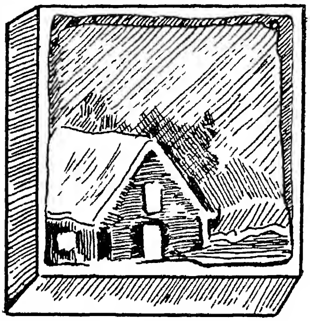


arrangement, but the capitals are usually in an upper case and the small letters in the lower part of the case.

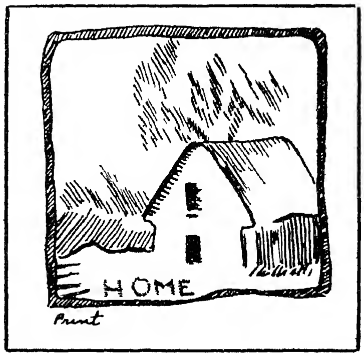
From this we get our terms "upper" and "lower" case letters The lay of the case below is the one used in English book offices.

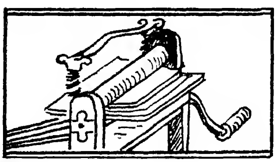
Sometimes only one font is kept in a case but frequently two or three type bodies are kept together. They are recognized by the nicks on the back. These vary with the types.

PRINTING FROM WOOD OR LINOLEUM BLOCKS

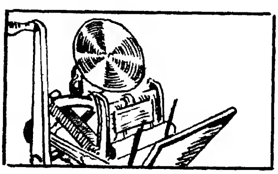


WOOD BLOCK





A HAND WASH WRINGER



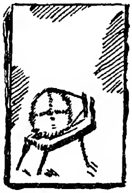
A HAND PRINTING PRESS

The picture is cut in reverse on wood or linoleum. The parts that are to be printed are left standing. The background is cut away. The printing may be done in various ways. with a block printing press, an old-fashioned letter press, or just by applying a weight.

Ink the block, lay the paper on it, and cover the paper with something having a thin, hard surface, such as a sheet of tin. Run through the wringer.

Set your block about ⅞″ high (type high), lock it in the chase, and print just as you would type or cuts.

PRINTING FROM ETCHED PLATES

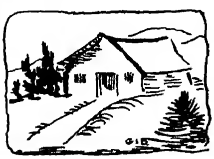


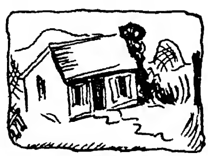
PLATE

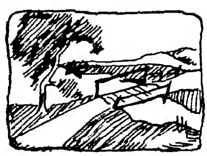
Draw the picture on metal. This can be done freehand or with a stencil. Cover metal with a wax that resists acids. Equal parts of paraffin and beeswax can be used. The outlines of the picture will show through the transparent wax. Scratch through the covering, exposing the outlines on the metal plate to the etching fluid. For copper, a solution of one part nitric acid and two parts of water may be used. It is important to add the water to the acid. A reversal of this process may cause an explosion. Solution should be prepared in an acid resistant container. Immerse the plate. Length of immersion must be according to the temperature of the room Remove the air bubbles which may form on the metal.

When plate is eaten deeply enough, warm it and remove the wax. This leaves a copper plate with the picture cut into it. Using a brayer or a stiff brush, apply ink to the plate, and then remove it from the uneaten part with a stiff cloth. This will leave the ink in the lines.

Soak soft drawing or etching paper in water for several hours and then blot it. Place plate on a hard block, over it the dampened paper, then a pad of folded cloth on top. Apply pressure and you will have a print. The paper and the block should be somewhat larger than the metal plate This forms a mat. The pressure may be applied in a regular etching press, a wash wringer, or even the letter press.







PRINTER'S LANGUAGE

When you begin to get acquainted with a printing press and its equipment, it is wiser to learn to call things by their real names. If you want to order supplies from a catalogue or shop, it is easier to identify your needs. In fact, it is a point of pride to use printer's language if you are a printer.

Bill of Type—Regulation of the number of letters in a font

Case—A flat box for holding type.

Chase—An iron frame to hold set type in the press.

Colophon—A statement at the end of any work, giving the date, the place and the printer's name

Compositor—Type setter.

Copy—Original manuscript

Font—A proportional quantity of the letters and symbols of the alphabet in any one face of type. A job font is sufficient for setting cards and small circulars. More composition would require a weight font.

Form—Type and furniture locked in the chase. Pages may be folded in order. (See illustration on page 82.)

Founding—The casting of type.

Furniture—Wooden blocks used in the chase to fill space in form.

Galley Proof—A print made from type laid in the galley

Galley—A shallow metal tray to hold set type before it goes into chase.

Half Tone—An engraved plate for reproduction, made from a photograph or toned drawing.

Illumination—Hand-drawn letters used for decoration on printed pages.

Intaglio Printing—Ink carried in grooves of plate and pressed out onto paper.

Line cut—An engraved plate for reproduction made from a line drawing.

Lithography—Printing from stones or flat metal.

Off-Set Printing—A method based on planographic and photographic devices.

Planographic Printing—Designates printing produced from flat plates.

Platen—The plate which carries the paper in the press.

Points—Unit in measure of type (app. 72 to 1 inch.)

Proof Reader—One who reads proofs to detect errors.

Quadrats—Called quads. Pieces of lead in same size as type, used to separate words.

Quoins—Iron wedges used to hold contents of chase in place

Relief Printing—(As contrasted with planographic printing) matter printed from type or engraved plates.

Rollers—Gelatin rollers used to carry ink from fountain to type in chase on a press.

Rubricated—Pages of matter written by hand, or printed and decorated by hand.

Setting Type—Picking out letters and placing them in composing stick.

Signature—A sheet folded to make 4, 8, 12, 16, 24 or 32 pages

Spacing—Use of spaces between words.

Stick—A device to hold type as it is taken from the case.

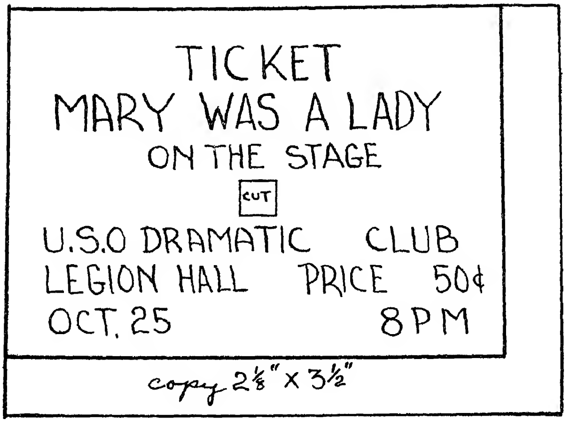
Type—See illustrations on page 82.

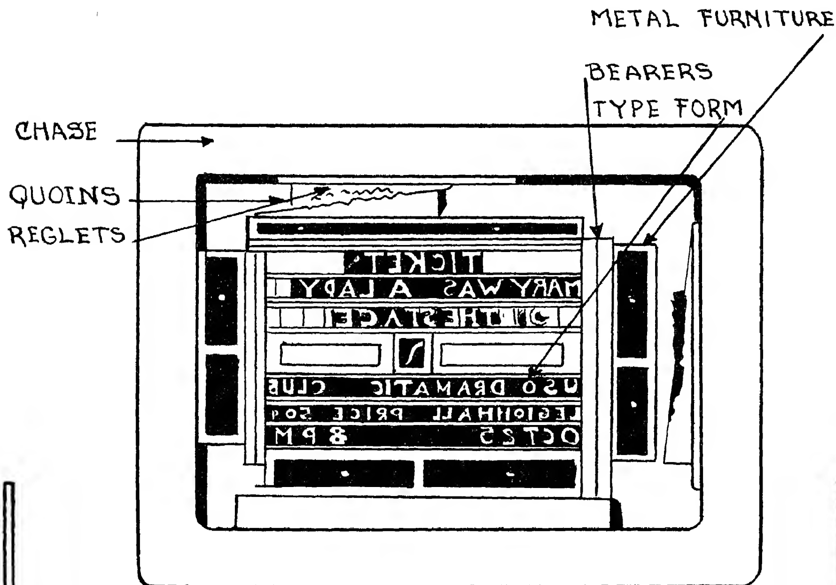
Typography—The art of printing with type.

Washington Press—See illustration on page 81.

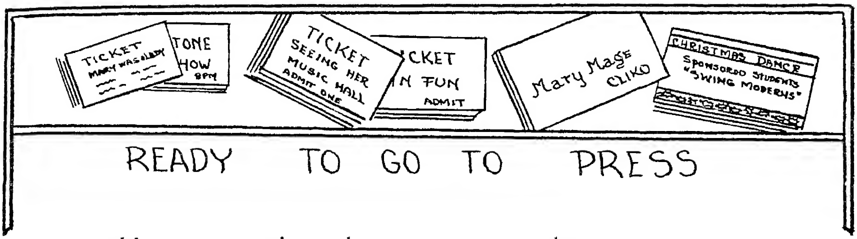
Wood Block—A block of wood on which a picture is drawn and all of the face removed excepting the parts which are to print.

TICKETS FOR THE SHOW





TYPE LOCKED IN CHASE



You could start as easily at this point as any other.

Decide on your copy. Write it out, and if some other person is responsible for its accuracy, have them check it

Set composing stick for the longest line Find the centre and centre the word TICKET. Remember to set type from right to left. Fill out space on each side of TICKET with quads. Put lead strips between lines to make space.

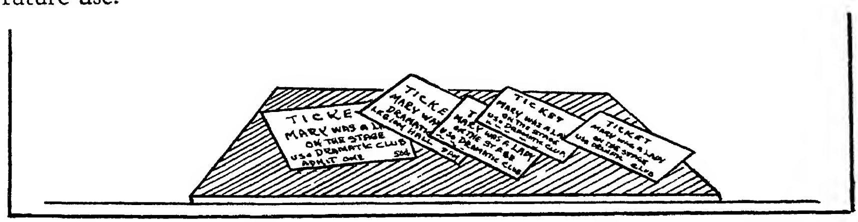
Set MARY WAS A LADY and centre it. Always fill in space at end of each line with quads. Put in leads and continue until all type is set and centred. Place it in the chase. Fill in space above and below with leads and furniture. Lock in the quoins and you are ready to print in one colour.

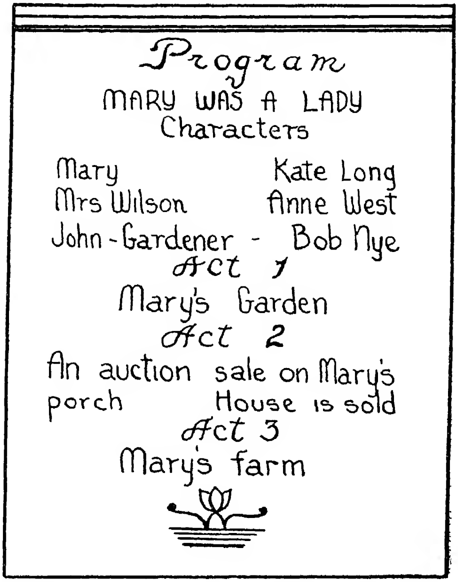
See that your rollers are in place and clean. Put a clean cover on the platen Set your guides to hold the cards. Put the ink on the plate. Be sure the plate and the ink are warm enough to work well. Last of all, put the chase in place

Put a sample card of the proper thickness in the guides and pull off a trial copy. Check for spacing and spelling and for letters that are not printing or are smudged. If all is in order, you are ready to print ten or ten thousand tickets

As you lift the cards from the platen lay them on a flat surface to dry. Newspapers or other paper make good slip sheets to put between the layers of cards.

Don't forget to clean the press and type, after which the type should be returned to the case When the order is something you may want to repeat soon, remove the type from the chase and tie it in a package to be kept for future use.



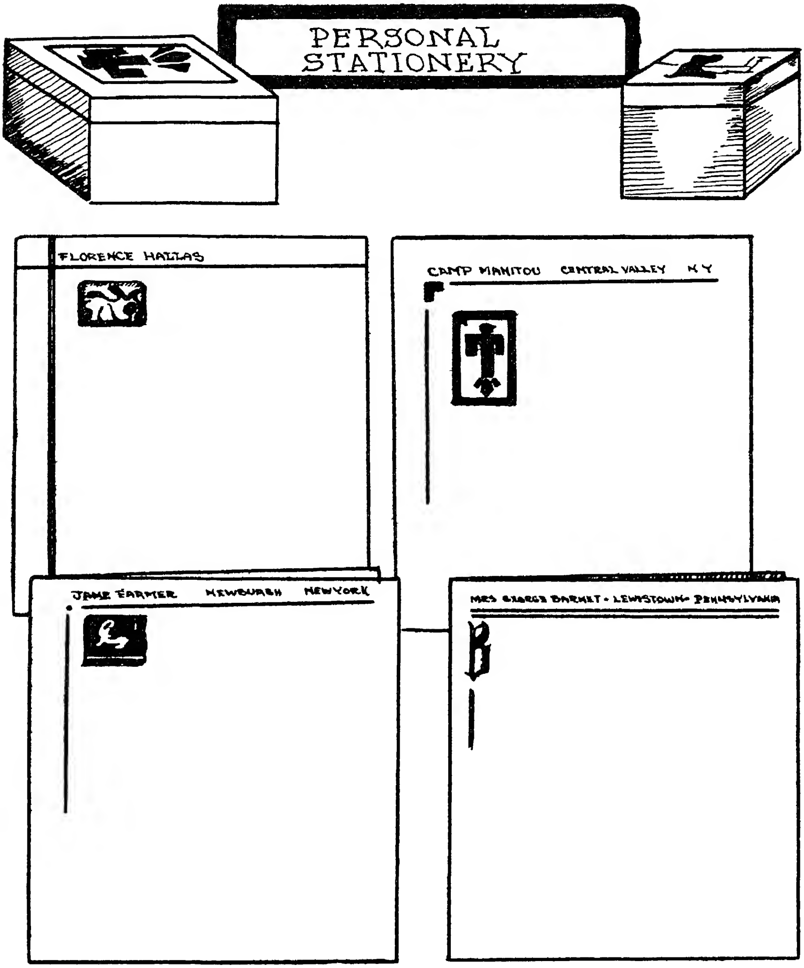


PRINTING IN TWO COLORS

For a two-colour programme prepare copy and have it checked Set the type in the composing stick, beginning with MARY WAS A LADY. When it is filled transfer to the chase. Continue until entire programme is set. Centre each line and lock it in place with the quoins.

Continue as usual, leaving space at top and bottom of programme for lines and the word PROGRAMME, which are to be of another colour.

When programmes are dry, clean plate and rollers and apply second colour of ink. Set the liners and the word PROGRAMME in the chase. Use furniture and quoins between. Print coloured lines Any other line may be omitted from the first chase and set in the second.



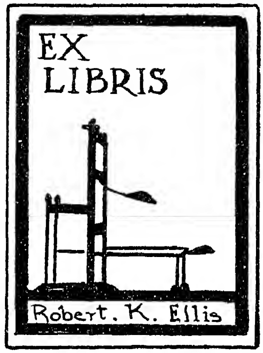
Letterheads

For the hobbyist, letterheads and personalised stationery are two of the most attractive and remunerative phases of printing. Devising and setting up one's own letterheads for business or private use is interesting, and it is easy to pick up a little trade of this kind.

There are certain rules to follow in punctuation and spelling. The arrangement depends upon the use for which the paper is intended, and the taste of the person who will use it.

There is a time-honoured division as to the kind of type face to use. The first is book type, which includes Roman and Italic, and the second is job type, which includes numberless variations of the Roman and Italic letters.

BOOK PLATES

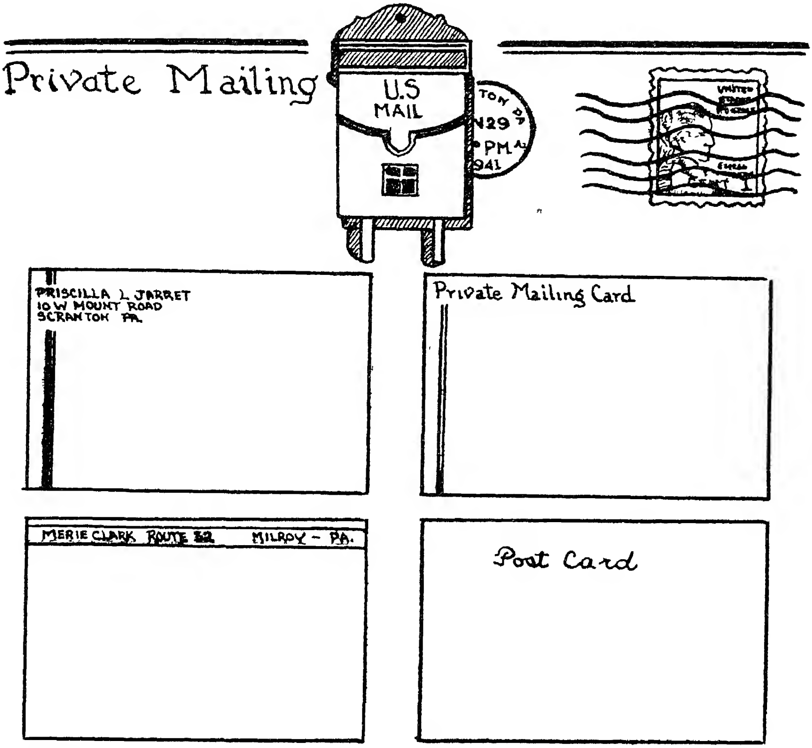


If you have access to a press, making book plates for yourself and for your friends is a pleasant and profitable pastime.

In a small thing such as this you can try the unusual or you can use a conservative design, if that is your taste. Sometimes a hobby or occupation is shown on a book plate. In those illustrated here, Zole Blecher lives on a farm, and Robert E. Ellis is a printer.

These plates were made from linoleum blocks. The lettering was done with type. First the linoleum cut was made with space left for the lettering. Since the blocks were set type high, they were printed in the printing press, though they could have been done by any pressure device.

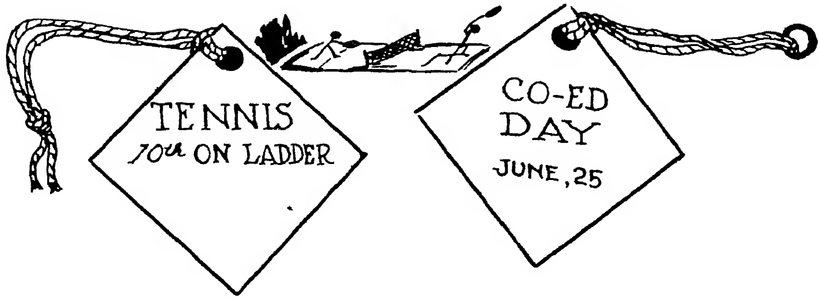
When they had dried, type was set to do the lettering in the press. The lettering could have been impressed in the matter of a galley proof, but both the lettering and the block printing came out clearer through the use of the printing press.



Post cards for personal use

Post cards of the type shown here may be printed on government cards which are already stamped, or they may be cut from any medium weight stock. Light colors printed in a darker or a contrasting color of ink make attractive and individual cards. When made from stock, they are cut $3\frac{1}{4}$ inches wide and $5\frac{1}{2}$ inches long.

These cards make nice gifts and also sell well in shops. Many uses can be found for good looking cards.



PRINTING FOR A RECREATION GROUP

Very fortunate is the recreation group that can afford to have a printing press. There are always tickets to be printed, announcements of special events, programmes, scorecards, tallies, invitations, tags—a score of uses, and all of them fun.

Printing can, of course, be a one-man hobby, but it also makes a fine group activity. One person can provide the copy, another set the type. One can be assigned to run the press, another to handle the paper. There will be blocks to be cut, and the type must be returned to the tray in good order when the job is finished In making tags, there are holes to punch and strings to attach. Programmes sometimes require folding. Then, of course, the press will have to be cleaned. Rotation in office will probably be found desirable, so that everyone can have a turn at the more interesting tasks and do his stint of humbler assignments.

YOU CAN PRINT A PAPER

A printing press is a most desirable piece of equipment in schools and camps and recreation centres. It provides an absorbing occupation and suggests a fine group project—getting out a newspaper.

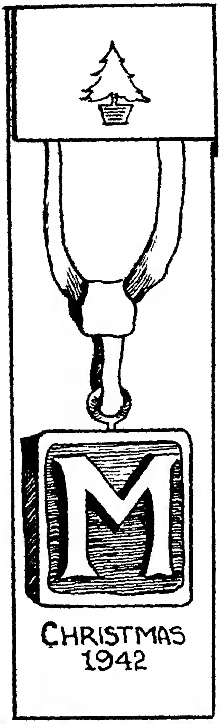
Setting the type for a paper of any dimensions is an ambitious undertaking, but there are sure to be some in a group who love contact with printer's ink, and it is within the range of possibility. At least you can set the heading, the head lines, and any cuts that are to be used. The rest can be done on a mimeograph machine or some other kind of duplicator. This makes a good looking paper and does not take too much time.

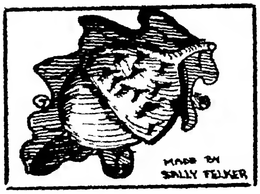
The art department can make linoleum or even zinc line cuts. Small drawings for column heads—"dingbats," in printing parlance—are effective when drawn with a stylus on the mimeograph stencil.

In many small villages a news sheet makes a hobby which will in time pay its way. It is a friendly way to use time and to arouse interest in your hobby.

A good hobby does not shut us away from our associates. Instead, it grows and makes us grow with it, when it enjoys the stimulus of outside contacts

FOR DETAILS SEE YOUR DAILY NEWSPAPER. IT WAS NEWS YESTERDAY—





CARDS for CRAFTS—GIFTS

One printer found use for his press by making cards for small craft articles which were to be used as gifts or sold in shops. It gave the gifts a "dressed up" look and identified them as hand-made crafts. It also simplified the handling of miniatures.

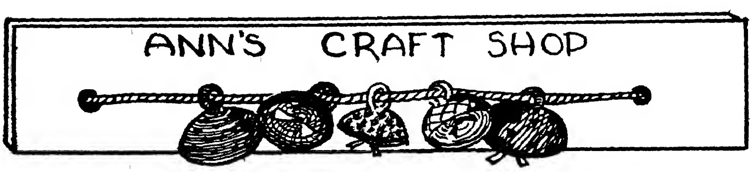
Several of the craft articles pictured here can be easily made simply by looking at the illustrations.

The pendants were made by children for their mothers as Christmas gifts. Their teacher helped them print the presentation cards. The ribbon was fastened under the flap and a little paste used under the pendant.

The acorn pins were made by a draftsman who was well known locally, and it added to their value to have her name on the card.

The necklace from Ann's Craft Shop was made from acorn cups strung on a cord. The card made them easier to pack and kept them neat.

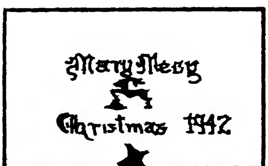
The Amish dolls were sold in pairs. They were miniatures and the cards served the additional purpose of identifying them in communities where this particular sect is not known.

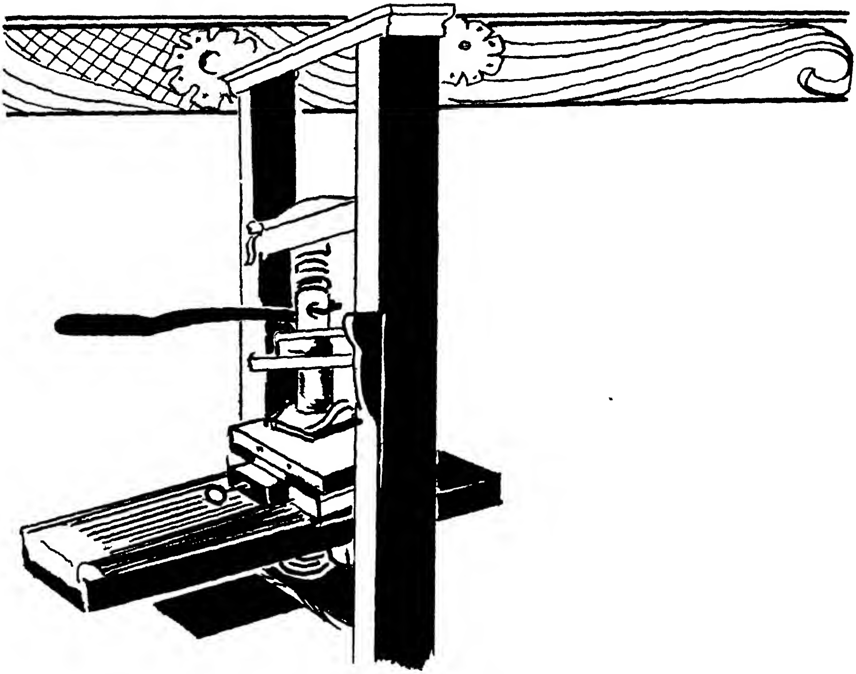


There are a great many ways of using the printing press to make Christmas cards. The quickest way is to use ready-made characters, letters and cuts. The card at the upper left corner was produced in this manner. The cut or picture was made at a commercial founder's shop. A simple line drawing was sent to the founder and an inexpensive cut made from it. The small Christmas figures across the bottom came from a set of seasonal cuts. The name and CHRISTMAS 1942 were set with type. Everything was set in one chase and printed at the same time. The picture and the little cuts could have been set in one chase and the remainder set up in another. In this way two colours could have been used.

The card on the right was made from a linoleum block set type-high. Type was used with this. One, two, or three colours could be used.

The little card at the bottom was used with unmarked Christmas cards and in gifts. It was cut from oak tag and printed in brown ink.





WHY DON'T YOU PRINT A BOOK?

The urge for authorship lurks in almost every one of us, and it has been said that every one has at least one good story he might tell. But there are so many obstacles that most of us never get down to it. Perhaps you haven't a story of your own, but have a friend you could write about. So why not start at once? Write your book, be your own printer and publisher. Be your own book binder. Think how delightful it would be to see a book all of your own making.

Perhaps it won't sell. Well, give it away. You can print a hundred copies and bind them a few at a time. It will give you great satisfaction, and perhaps, a hundred years from now, your handcrafted books will be rare collectors' pieces.

THE FIRST PRINTER

In this chapter has been outlined the process of hand-press printing. If you have been inspired to become a craftsman you will perhaps be interested in the history of printing, and there are many splendid books on the subject. Here we have space only for the outstanding facts and dates.

So far as is known, the Chinese were the first printers. The oldest known printed book, printed from blocks, was discovered in the province of Kansu in 1900. It is dated May 11, 868, and states that it was printed by Wang Chieh for free distribution, as an act of filial reverence.

Printing from movable type was first done by Pi Sheng in China in the years 1041 and 1044, but the new art was not generally adopted, probably because the ideographic characters of written Chinese made it too difficult and costly.

Movable copper types seem to have been used by the Koreans as early as the first part of the fifteenth century.

So far as is known, the discovery of letter-press printing in Europe was independent. It is assumed that the date is around 1440.

Early books were printed from engraved wood blocks, the term "block Books" indicating that all the words on the page of a book were cut by hand on a solid block of wood. These probably preceded the invention of movable type printing and they continued to be printed long after the press was established. The earliest block book extant is dated 1470. Pictorial block prints before that date still exist. Block prints were produced in Japan as early as A.D. 770.

Claims for the European invention of printing are made for Germany, Holland, France, and Italy. Laurens Coster of Haarlem, Holland, has had strong support and it has been said that some of his workmen went to Germany and sold there the process they had learned from him.

However that may be, the first documents bearing a printed date are letters of indulgence, issued in 1454 and 1455 from a press in Mainz, and ascribed to Johann Gutenberg. The first book to be printed from movable type was the Vulgate Bible, published in Mainz in 1456, also attributed to Johann Gutenberg. It is sometimes called the Mazarin Bible because it was found in the library of Cardinal Mazarin, and it is also referred to as the 42-line

Bible, because most of its pages are 42 inches to the column, with two columns on a page. Thus, early, the technicalities of printing became important

In 1457 the Mainz Psalter was published This was the first book to bear the name of printer, place, and date of publication. It was also the first attempt at colour printing. The printers were Johann Fust and Peter Schoeffer, the latter one of Gutenberg's workmen.

A political upheavel in Mainz sent many citizens into exile. Some of the printers were among those who were scattered over the continent. Both Italy and France took favorably to the new art and it was developed and improved.

One of the early names in printing is that of Nicolas Jensen, a Frenchman, who worked from 1470 to 1486 He added lower case letters to the capital letters he found on the Roman monuments and the type design he created has remained standard.

William Caxton was England's first printer. He was originally a mercer by trade. He spent about thirty years on the continent. At Cologne he learned printing, and with Colard Mansion he set up a press first at Bruges. He returned to England and in 1476 set up a press in Westminster.

Pioneer printers in all other countries were wandering Germans, but England's first printer was an Englishman who used only his native language. Caxton wrote or translated much of his own copy. He also designed his own type faces and used them instead of the Gothic or the Roman type fonts.

In the 16th century, ecclesiasts and political leaders placed bans on the new art, which was so powerful an ally of the men who were challenging their rule. For a time after this printing deteriorated.

There were always independents, however, who pursued it as a hobby. And in France, the low countries, and in England, certain families devoted themselves for generations to the art, so that their names have come down to us.

In 1720 William Caslon began to produce a type face refined from that of Nicolas Jensen, which is still in general use. He was one of the great influences in typography.

In the Western Hemisphere printing is supposed to have begun in Mexico City in 1539.

In the United States the first press began at Cambridge, Massachusetts, in 1638. The first work run off was the "Freeman's Oath," and the first book was known as the Bay Psalm Book, produced in 1640.

William Morris, in late Victorian England, led a revival of printing as a fine art.

Other famous names in the field of type design and printing are Baskerville of Birmingham, Bodoni of Parma, the Garamond family of France, and Frederic W. Goudy.

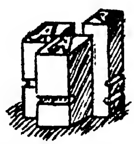
To-day we have in this country some fine establishments doing quality printing.

The general outline of the development of bookmaking for those who might wish to make a chronological study is as follows:

Classical and mediæval books, transcribed by hand and often illuminated.

Initial letters stamped in ink from engraved blocks of wood used in the 13th century in Italy and Spain, in place of hand rubrication.

Autographs and trademarks; playing cards; textile fabrics block printed; religious pictures printed with and without lettering; engraved words without pictures; and then movable type founded in a mould.



CHAPTER VII

Bookbinding

BOOK MAKING was one of the great mediæval handicrafts, brought to high perfection in the monasteries.

Many a monk spent a lifetime copying a single book and counted it time well spent. Another would devote years to the binding of the same volume. Fortunately for those of us who love beauty and fine craftsmanship, there are many examples of their work still to be seen in libraries and museums.

The hand-lettered pages were relieved with illuminated capitals, beautifully coloured, and sometimes with miniature painting of religious subjects. The covers were of wood, leather, or metal, intricately carved or tooled. Each volume was a priceless work of art representing the life-achievement of several men.

It is recorded that there was an attempt made at mass production of books some time before the monasteries became the chief repositories of learning. A thousand slaves were seated at desks before one large piece of copy on a chart, and even so it took years for the work to be completed.

A profound study of book making would carry us back to the time when records were kept on stone tablets, pieces of bark, rolls of parchment, and finally, paper, which came into use in the twelfth century.

From the fall of Rome to the twelfth century the making and selling of books were in the hands of the monks and we have them to thank for this beautiful craft. They are a luxury, a hobby, and a fine art, and, unlike some other fields, the commercialization of book making has not detracted from the appreciation of fine bindings, but has increased it and ensured its preservation as an art.

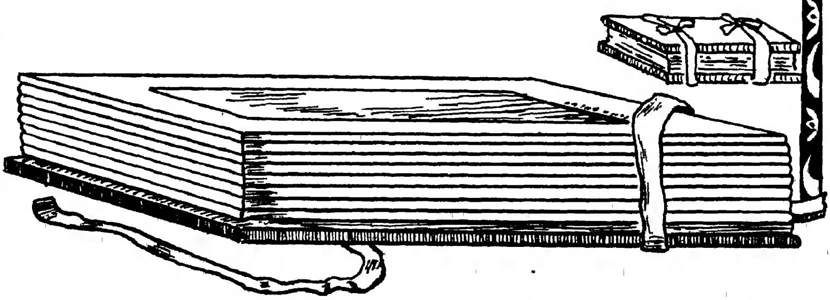
FOLIO BINDING

Early writings were done on scrolls of parchment which were rolled when not in use. These scrolls were awkward to handle, and were not durable for constant use, for frequent winding and unwinding weakened them, and in some cases, when they cracked or broke, words and phrases and even whole lines of text were lost or obscured. That is one reason why there have often arisen disputes among scholars, for, in re-copying manuscripts, the scribes often guessed at or supplied words not clearly readable in the original.

To prevent this, folio binding was devised. Scrolls were cut into large pages. Each page was laid on a board and then another board was laid on the top. Thongs were attached to the lower board and the boards were tied together, thus holding the manuscript in place.

This is a good way of binding large sheets, drawings, or mounts. The boards and thongs form a press, protect the pages, and yet leave them free to be removed as needed.

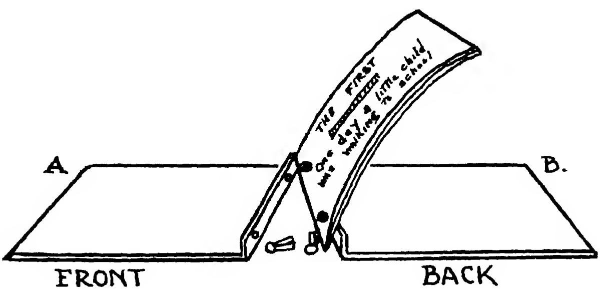
Strong cardboard, trunk fibre, beaver board, plywood—all these materials can be used for folio binding. The cover boards may be decorated on the outside and lined inside. Use leather for thongs, tooling it if desired. Soft metal can be nailed to the top or the corners, and embossed or etched, for added decoration.

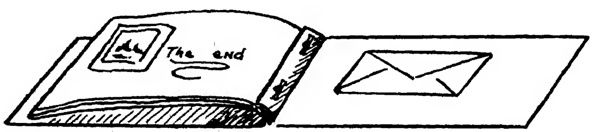


A CARDBOARD BINDER

To make a simple binder, cut two cardboards a little larger than the leaves you are going to bind. Allow 1″ extra for the edge where the fasteners go, and at least ¼″ on the other three sides. Light weight oak tag is good material or, if you want a more finished binder, use heavy boards covered with glazed chintz, oil cloth, or some composition leather. Hinge and line them.

For pages measuring 8½″ × 11″ use two sheets of oak tag, 9″ × 12¼″. Bind the 9″ edge. Fold the right edge of A and the left edge of B as shown here. Punch holes along the left edge of the paper beginning 1¾″ from the top and the bottom, and ½″ from the edge. Use muslin reinforcements on all holes. Place leaves between back and front folds, as illustrated. Use brass paper fasteners, making sure they are long enough to go through the two folds of cardboard and turn down enough to hold securely. Fasteners should be put in from left to right, so that the brass heads will be on top as the binder is opened.

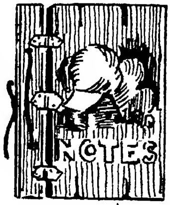




A CARVED WOOD COVER

CHIP CARVED

Select your wood according to your skill at carving. Some woods are harder to work than others. Basswood or a fine-grained wood such as walnut is suggested. Your wood should be ½″ longer and wider than the pages of the book.



BAS-RELIEF

The Hinges. Cut a 1″ strip from the piece of wood to be used for the front cover. This strip will form part of the hinge. Small metal hinges can be bought in a hardware store, or, if you prefer, you can make some of leather. Do not attach them, however, until the carving is finished.

The Carving: Draw the design on the wood and select suitable tools. For low relief carving, small chisels work well. For chip carving, a regular chip carving knife is best, but a pocket-knife with a pointed blade will serve. Doomsday Book, by the way, has a carved wood cover.

Finishing the Wood: If a light coloured wood is to be stained, penetrating oil stain or wax crayon is satisfactory. Use a cloth to apply stain, and another to rub surplus paint from the wood, to keep the grain clear. Remove extra crayon with a stiff brush. Finish with shellac or wax.

Shellac mixed with sewing machine oil makes a good finish for light wood. For dark woods, wax is better.

Sometimes oil paints are used on the detail of designs. Varnish or shellac is applied over these.

The inside of the wooden cover can be lined with felt or heavy paper, or it can be finished like the outside.

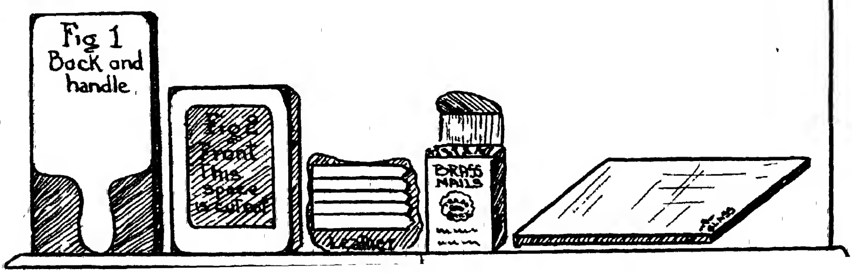
The 1″ strip may be carved, remembering to leave space for holes 2″ from each end.

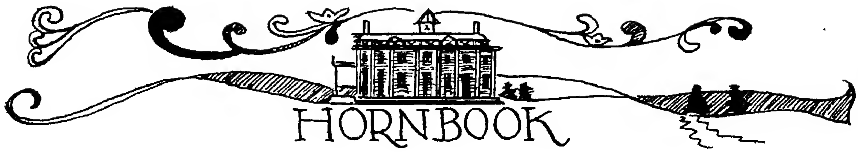
Attach metal or leather hinges to the strip and the front cover. Do not cut or hinge the back cover. Lay front and back together and bore holes through the 1″ strip and through the back for fastening sheets between the covers.

The Horn Book was one of the principal features of school life in colonial America. It was a kind of primer, used to teach children their letters, and derived its name from the transparent horn or cuticle-like substance placed over the single page of writing of which the book usually consisted.

The book illustrated here will show you that this strange variety of text book resembled a hand mirror with a page where the glass would ordinarily be. Sometimes the pages were put in to stay, but the one illustrated had a series of pages which could be changed.

The Horn Book as a hobby project is kin to the sampler and should be done in that spirit. A little poem, the picture of an event with a brief description, names, dates, flowers, a child's handwriting—any of these would be appropriate as content. A page from your first primer would make an attractive theme. One little girl referred to the Horn Book as "a picture book with a handle."





Make your frame of carved wood with leather hinges or wooden pins and fasteners.

Materials Required

1 piece of wood—6″ × 12″ × ¼″—for back, which includes handle, all in one piece.
1 piece of wood—6″ × 8″ × ¼″—for front, which forms the frame.
5 pieces of leather—1¼″ × ¼″—for hinges and fasteners.
1 piece of glass—4¾″ × 6¾″—to cover and protect leaf or leaves of Horn Book (optional).

Cut the largest piece of wood for the back and handle (in one piece), and mark it.

The next in size will cover all of the back except the handle. Determine what shape you want your Horn Book to be, square or oval, and make a paper or cardboard pattern. If you use the dimensions given here, your pattern should be 8″ × 6″, and the finished book will be slightly less than that, allowing for the working of the wood. Draw your pattern on both pieces of wood. Then cut and carve the back and handle. (Fig. 1.)

Now take the smaller piece (the frame) and cut it according to your pattern. Then draw a line ¾″ from the edge on all sides of the frame. Bore or cut a small hole near the centre of this piece, and saw from this hole to the line you have drawn. This will leave a frame ¾″ wide. Carve or decorate the frame.

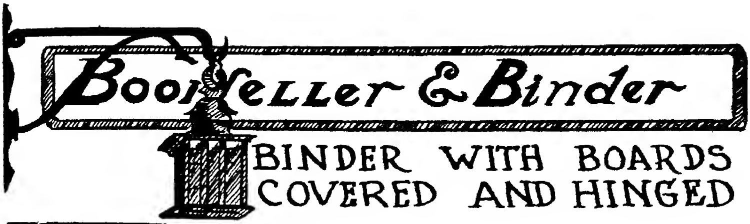
If you are going to use a glass, cut a ledge $\frac{1}{8}'' \times \frac{1}{8}''$ on the inside of the frame to hold the glass in place. Be careful not to split the wood.

Take two of the leather strips you have cut to the size given above and tool them, and, using small brass nails, fix them to the bottom of the book, nailing them fast to both the back and front pieces. These are to give play enough for opening the book to replace leaves, at the same time holding back and front together.

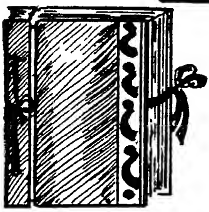
Use the other three pieces of leather as hinges, one for the top, and one for each side. Attach them to back of book, at sides and top, with small brass nails.

On the top, or frame, place brass tacks, small knobs, or projecting wooden pins, to correspond with your fasteners. Cut little slits (like button-holes) in the leather fasteners to slip over these. If you plan to make a book that will not allow for changing the pages, the fasteners and hinges may be omitted and you can put the top and bottom together with small nails. Another way is to bore holes through both frame and back and force in wooden pins.

If you are using glass, fit it into the frame. Mount your pages on stiff paper, cut to fit the frame, and assemble. The Horn Book is ready for use. Bore a hole in the handle for a hanger, or tie a thong to it. Assign it to a good place in the living-room or library, for a Horn Book, ancient or modern, is a treasure, and your friends and visitors will enjoy it.



BINDER WITH BOARDS COVERED AND HINGED

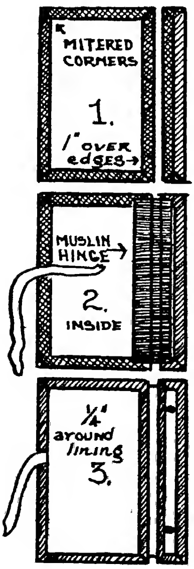


The binder described as a cardboard binder can have its boards covered and hinged. which will make it stronger and increase the possibilities for decoration.

Materials for Cover for 8″ × 10½″

2 pieces heavy cardboard—9″ × 10½″—A
2 pieces heavy cardboard—10½″ × ¾″—B
2 pieces heavy muslin (for hinges) 8½″ × 2″—C
2 pieces heavy paper or cloth 11″ × 12½″—D
2 pieces cover paper or cloth 12½″ × 1¾″—E
2 pieces lining paper—8½″ × 10″—F
2 pieces lining paper—10″ × ½″—G

DETAILS OF THE INSIDE OF COVER



Cover outside of boards (A) with paper or cloth (D), by pasting D on to A. Turn in 1″ of your covering material on all edges. Mitre the corners. (Fig. 1.)

Cover outside of boards (B) with cloth or heavy paper (E), using paste. Turn over 1″ at ends and ½″ at sides. Mitre the corners.

Lay your board covers (A), outside down, on a table or flat surface. Between the two covers, in finished positions, lay boards (B). Paste or glue together the covers (A) and the narrow boards (B) with the strips of heavy muslin (C). The muslin strips are 2″ shorter than the boards, so place them 1″ from top and bottom. (Fig. 2.)

Tapes for closing the binder are attached to inside as illustrated.

Lining papers (F) are put inside the large boards (A). Allow ¼″ on all edges. Lining papers (G) are put inside the narrow boards (B). Allow ¼″ around paper.

Punch holes in narrow strips (B) $2\frac{1}{2}''$ from each end, or to suit any punched paper which is to form the pages. Use an eyelet attachment and metal eyelets or, if not available, punch holes and put cloth reinforcements on both sides. Paper fasteners or cord may be used.

BINDER WITH PAGES PASTED TO SEWED STUBS

If you want to make a binder with attached leaves, the type illustrated is easily made, very durable and opens completely flat.

Materials for Twenty 9″ × 12″ Pages

2 pieces of cardboard—12½″ × 9½″—A
1 piece of muslin—12½″ × 2″—B
1 piece bookbinder's muslin, heavy paper or leather—13½″ × 2″—C
2 pieces of cloth or heavy paper 13½″ × 9¾″—D
1 piece of lining paper 12½″ × 2″—E
2 pieces of lining paper 12″ × 9¼″—F
10 pieces of book paper 2″ × 12″—G

Bind the two pieces of 12½″ × 9½″ (A) cardboard together with the muslin strip (B). (Fig. 1.) Allow ½″ space between the boards. Put muslin outside.

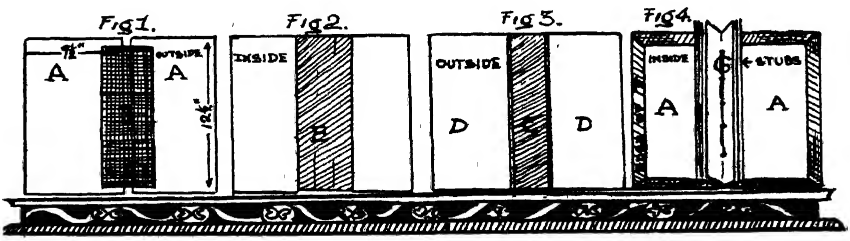
Cover inside of hinge you have just made with 12½″ × 2″ (E) lining paper. (Fig. 2.)

Fold ten pieces of 2″ × 12″ (G) book paper lengthwise through the middle. Lay into signatures of five pieces each. Sew to inside of covered muslin hinge as shown in Fig. 4.

Cover outside of 12½″ × 2″ (B) muslin hinge with 13½″ × 2″ (C) cloth, leather or heavy paper. Turn ½″ over hinge at top and bottom. (Fig. 3.)

On the outside of the covered hinge (C) draw a line ¾″ on each side of centre. (Fig. 3.)

Place edge of D on lines, allowing ½″ at top and bottom. Paste the paper over the cardboard. Turn top, bottom and outer edge under the cardboard. (Fig. 4.)



Make mitred corners at outside edges. See detail in illustration of mitred corner.

Paste lining paper, 12″ × 9¼″ (F), on inside of board. Allow ¼″ at top and front. The inside edge comes as near as possible to page stubs.

The book is finished when the pages are attached to the stubs. (Lap so the pages are ¼″ inside edge of cover.)

The outside can be decorated to suit the material and the contents of the book. If paper is used, painted lettering, cut paper and shellac are suggested. For cloth, block printing done before or after the binding, is a satisfactory medium. Tooling of leather gives a permanent pattern and beautifies the material.

A PORTFOLIO

A substantial portfolio, hand-fashioned, is another good enterprise in the bookbinder's art.

The dimensions given are for a portfolio which will hold leaves as large as 18″ × 24″. It may be covered with cloth or heavy paper.

Materials

2 pieces of heavy cardboard—26″ × 20″—A
2 pieces of heavy cardboard (flaps)—26″ × 4″—B
6 pieces of heavy muslin—26″ × 3″—C
2 pieces of heavy paper or light leather—28″ × 2″—D
2 pieces of heavy cover paper—28″ × 19″—E
2 pieces of heavy cover paper—28″ × 4½″—F
2 pieces of lining paper—27″ × 19″—G
2 pieces of lining paper—27″ × 3″—H
4 pieces of tape—8″ in length

Join 26″ edges of cardboard (A) with strips of muslin (C) to form hinges. Put muslin inside and outside. Allow 1½″ between. Join 26″ edges of cardboard (B) to outside edges of cardboard (A) to form hinges for flaps. Put muslin inside and outside. Allow 1½″ between.

AMERICA LIVES IN THE HEARTS AS GENERATIONS LIVE IN AMERICA

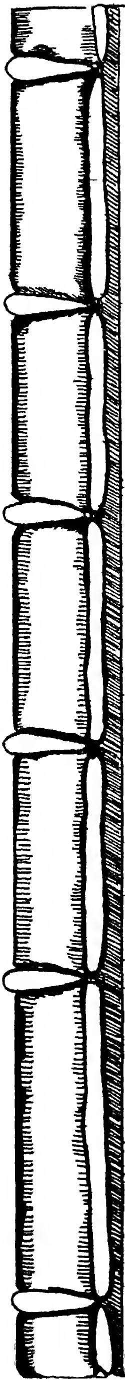
Cover outside of hinges with light leather or heavy paper (D). Turn 1″ top and bottom.

Cover board with paper (E). Let paper join the leather (D) at edges. Turn cover paper over top and bottom.

Cover flaps with paper (F). Have paper join leather at edges and turn over 1″ top and bottom. Turn under front edges and make mitred corners.

Lining may be in one piece which is cut to fit ½″ away from all edges, or each piece may be lined separately with lining paper (G), for the large boards. Lining paper (H) is used for flaps.

The tapes are placed under the lining and allowed to extend 6″ on the outside.



A SCRAPBOOK BINDER

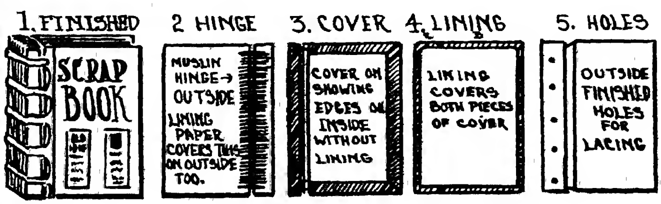
If you are a clipping or data collector, bind your own scrapbook, and then be as expansive as you will. The ordinary scrapbook of the real clipping enthusiast is likely to be an untidy, yawning object. If you make your own, however, you can use a binding that will allow for extra thickness. Envelopes may be pasted on some of the pages to hold small clippings or some that are more useful if they can be taken out.

Materials Needed for Pages 9″ × 11″

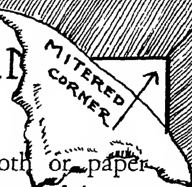
20 pages of paper (suitable for mounting)—9″ × 11″ —A
2 pieces of cardboard—9½″ × 10″—B
2 pieces of cardboard—9¼″ × 1″—C
2 pieces of heavy muslin (for hinges)—1½″ × 9½″—D
2 pieces of lining paper (to cover hinges)—10½″ × 2″ —E
2 pieces of heavy paper or cloth—10½″ × 10½″—F
2 pieces of heavy paper or cloth—10½″ × 1¼″—G
2 pieces of lining (to cover whole inside) 9″ × 10¾″ —H

Lay one large cardboard (B) and one narrow board (C) on table or other flat surface with one strip of heavy muslin (D) between them, allowing ¼″ for play of hinge. This will be your front cover. Repeat with the other boards (B and C) for the back cover.

Cover the muslin hinges on the outside of binder with lining paper (E). Turn ends over board ½″.



A SCRAPBOOK BI



Cover outside of boards (B) with heavy cloth or paper (F). Draw a perpendicular line ¼″ from centre of hinge, Lay edge of cover against this. Turn top, bottom, and front edges under board. If cloth is used, turn a narrow hem on material before pasting it on the line. (Fig. 3 for details of edges.) Mitre the front corners. Apply paste to the cover.

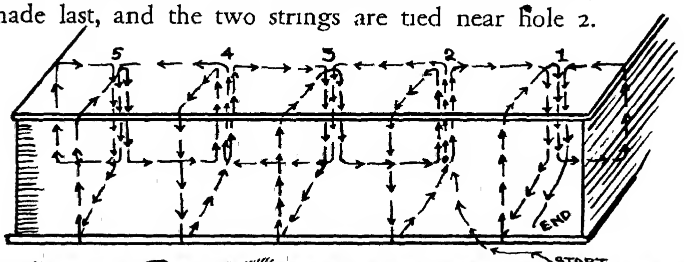
Cover the narrow board (C) with heavy paper or cloth (G). Draw a line ¼″ from centre of hinge and lay the edge of the cover to this. Turn a narrow hem in this edge of cover, if cloth is used. Allow ½″ top and bottom to turn under the boards. Last, turn in the back edge and make mitred corners at the back.

Spread out the binders. On the inside paste lining papers (H) over both B and C pieces. Allow ¼″ on all edges. (Fig. 4.)

Fold the 20 pages (A) with 1″ fold on the 9″ edge. Turn fold to left side.

To lace this binder, punch five holes in the narrow covered board (C). The holes are ¾″ from the left edge. The first and fifth are 1″ from the ends, the second and fourth 2⅞″ from their nearest ends, and the third or middle hole is 4¾″ from either end. Punch the cover and use it as a guide to mark the pages. Do not unfold pages for punching. Have the pages even with the back of the cover.

Lace them with a thong. Use the chart. Start at hole 1 and go up. Follow the arrows. Loops around the narrow board are made coming back. The loop around the beginning end is made last, and the two strings are tied near hole 2.



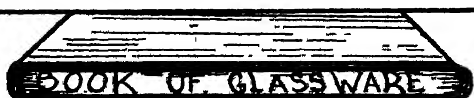
REBINDING A BOOK

Nearly every one owns a good book which has outlived its cover. Rebinding it will serve a double purpose to the novice bookbinder—as a lesson guide, and as restoring and saving a valued possession.

To start, remove the cover and boards if they are attached. If they have been torn off, save them as a pattern. Sometimes the cardboard can be salvaged. Occasionally the cover can be used as it is, and only the sewing and fly-leaves need to be replaced.

After the cover is off, scrape and soak away the glue which covered the sewing. When the pages are dry, remove the sewing without tearing the paper. Frequently new holes must be made, as the original sewing has torn or worn the old ones. Pile the pages of the book in their proper order. Mark and sew them by the instructions given in "Binding for Magazines." Glue the muslin strip and the tunnel to the sewing. Attach new head bands, as these are usually worn.

Prepare the cover if the old one is not to be used. Leather and heavy paper may be used as it is described in "Binder with Pages Pasted to Sewed Stubs." Use the dimensions of the book to be bound. Allow ½″ extra on length for cover if original cover is lost. This makes ¼″ extension of boards at top and bottom. For width, make boards as wide as book. The hinge is as wide as the thickness of the book with ¼″ added for extension and 1″ for overlapping of hinge and boards when they are first attached.



Make fly-leaves and lining paper by the instructions in "Binding for Magazines." (Fig. 2.) Directions for attaching fly-leaves and book to cover will also be found in this last-named chapter. Leather corners may be used by following the instructions in "Binding for Magazines." Cut away the paper and substitute leather.

Use hot glue which has been heated in a glue pot or a double boiler. Put book in press with waxed paper between damp sheets to prevent sticking.

If this is the first hand-bound book you have ever owned, it will give you great satisfaction, both as a possession and an accomplishment.

THE BOOKBINDER MAKES

A STATIONERY CASE

A writing portfolio with pockets for stationery and other paraphernalia of correspondence makes a fine gift, especially if it is hand-crafted and made durable and attractive.

Materials

2 pieces of heavy cardboard (boards)—7″ × 8½″—A
2 pieces of heavy muslin (hinge)—2″ × 8½″—B
1 piece of leather (for whole cover—1)—16″ × 9½″—C
1 piece of cloth (for whole cover—2)—16″ × 9½″—D
2 pieces of heavy paper (to be used together for cover—3)—7½″ × 9½″—E
1 piece of leather—1″ × 9½″—F
2 pieces of leather (for corners) (Unless C forms corners)—2½″ × 2½″—G
2 pieces of leather—2½″ × 2½″—H
1 piece of lining paper—8¾ × 14″—I
1 piece of lining paper (packet for envelopes)—8¾″ × 4″—J
1 piece of lining paper (for stamp envelope) (Figs. 2 and 3)—6″ × 6″—K

Lay cardboard (A) with 8½″ edges toward each other. Allow 1″ between them for hinge, which is formed by pasting heavy muslin (B) back and front of 1″ opening between boards (A).

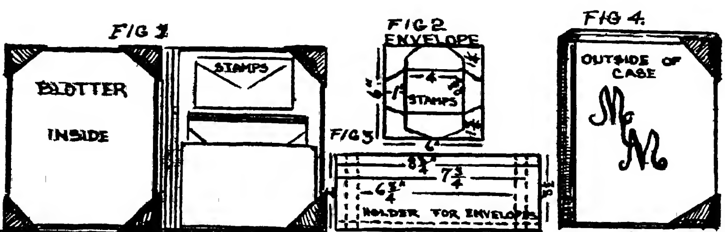
There are three choices of outside covers. No. 1 is entirely of leather and no outside

corners are used. No. 2 is cloth with leather corners, and No. 3 is of paper with a leather backstrip and leather corners.

If No. 1 (all leather) is used, cover leather with paste or hot glue and attach to outside of the boards. Turn under all edges and at corners cut closer to boards, and mould around edges. Use a celluloid modelling tool for this.

If it is planned to use No. 2, proceed as you did in No. 1, using cloth (D), but cut off corners about ¾″ from boards, allowing board to show. Cut each of squares of leather (G) into two triangles. Use two of these for the left corners, looking at book from the outside. Turn edges under ½″, making corners slightly rounded. Form corners by following the instructions given for No. 1 cover (all leather). For the right outside corners, fold the two pieces of leather (H) on bias from corner to corner. Repeat second fold through middle to form a triangular cap. Glue last fold in place. Slip this cap over the corners, thus making protectors outside and at the same time holders for the blotter inside. Put single ply outside. Use the other two pieces of G (which are now triangles) to hold blotter in place at centre of case. (Fig. 1.)

If No. 3 is to be made, the procedure is started with leather strip (F) being glued over hinge on outside. Turn under top and bottom. Fit pieces of paper ¾″ from centre of hinge. Proceed as you did with No. 2.

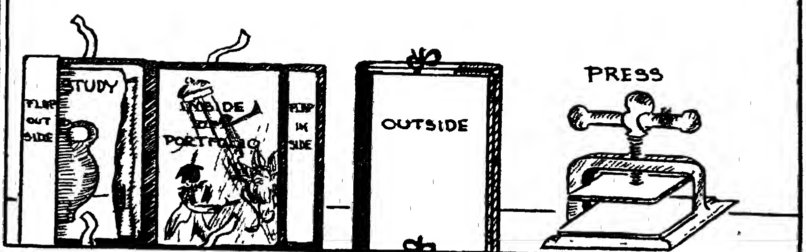


Paste lining paper (I) over whole inside. Allow ¼″ on all edges.

From lining paper (J) make a pocket with double ½″ folds at each end and one fold ½″ wide at the bottom. The double folds at ends make extensions to hold the envelopes. Lower fold makes a hem. Paste this with bottom even with lining paper. Paste on right side when case is open. (Fig. 1.)

From lining paper (K) cut a small envelope for stamps. Follow chart in Fig. 3 for dimensions. Paste it above pocket.

Cut a blotter 6¾″ × 8¼″. Correspondence paper of approximately the same size may be put in holders instead of blotter.



BINDING FOR MAGAZINES

Magazines of any consequence increase in value with time, so binding them is well worth while, for interest and reference and perhaps for future barter.

Stapled magazines of one signature are easiest to bind, but several signatures of one magazine can be used. If not too bulky, it is good to bind a whole year in one volume. This can be done with some monthly magazines. Weeklies and fortnightlys run more than one volume to the year, as a rule.

Remove the staples at the centre and lay the signatures or individual magazines in a pile in the order in which they are to run in the finished book.

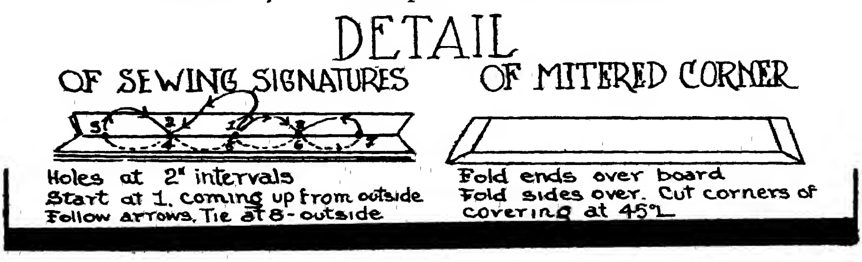
For cords, cut three pieces of heavy muslin 1″ wide and long enough to reach across the back of the magazine stack, and still allow 2″ to extend at each edge. Thread a strong, sharp needle with No. 20 linen thread to sew signatures. With a pencil draw lines across the back edge of the magazine pile. Use this order for a three-cord binding. Place two lines, each one ½″ from centre back, thus forming a space for the centre cord. Three inches from each line, moving toward ends, place lines, and then 1″ beyond each make another line. This makes a 1″ space for the outside cords. Put two more lines 1″ from each end. Number these in order, starting from the top of the book. (Fig. 1.)

Sometimes these lines are sawed $\frac{1}{16}''$ deep, or holes are punched on them with the needle as sewing progresses.

Sewing of Signatures

The sewing fastens each magazine to the cords. Let 2″ of thread extend from the first hole where the swing starts. Begin with the magazine which is to be first in the book. Go in at 1, so the needle is inside the first signature, come out at 2, over the first cord, and in at 3. Come out at 4, over the middle cord, and go in at 5. Come out at 6, over the third cord, and go in at 7. Come out at 8, go across to the next magazine, and in at 8 on it. Come out at 7, over the third cord, in at 6, out at 5, over the middle cord, in at 4, out at 3, over first cord, in at 2, and out at 1. Tie thread to the piece which was left in the beginning to make knot. Continue as you started, attaching magazines or signatures until all are used. If extra thread is needed, attach it between magazines or signatures. Tie last end securely.

When this is done the bound edge of signatures and tape between the sewing are covered with hot glue. Have the muslin as wide as the book is thick and $\frac{1}{4}''$ shorter than the magazines. While the glue is still soft, shape the book to a slight convex curve at the back and put it in a press. An old letter press is satisfactory if a book press is not available. Let it



BINDING FOR MAGAZINES

stay in the press until it is dry Wax paper can be used directly over glued parts to prevent sticking

Head bands are made or bought tape is used. To make them, use folded strips which are as long as the book is thick and about ½″ wide when folded. Overcast the closed edges with a buttonhole stitch. A narrow border design may take up ¼″ space below. Head bands are fastened around the back of the pages at top and bottom. (Fig. 2.)

The cover is made by using two pieces of cardboard which are cut ½″ longer than the magazines. They are cut as wide and an extra ½″ is allowed at the back or hinge so that the cover extends ¼″ beyond the front edges of the magazines. Attach these boards with a hinge. (See Fig. 1 in chapter on "Binder with Pages Pasted to Sewed Stubs.) Allow as much space as the thickness of the book and ¾″ for turning of the cover, plus ¼″ extension at front edges. Spread this out flat as is shown in Fig. 1 mentioned above. Lay hinge on upper side. If the book is a full leather binding, using one piece of light-weight leather, a piece is cut to fit the boards and hinge with ¾″ extending on all sides for turning over the boards to finish edges. Cover back of leather with hot glue and spread over boards and hinge. Contrasting corners may be made by cutting away the leather corners after the cover is attached, and attaching identical shapes cut from another colour of leather. Turn all edges under, using mitred or modelled corners. (See illustration in chapter on "The Bookbinder Makes a Stationery Case." Directions will also be found in that chapter.

Fly-leaves and lining papers are cut the same size as the pages of the magazines, but double with the

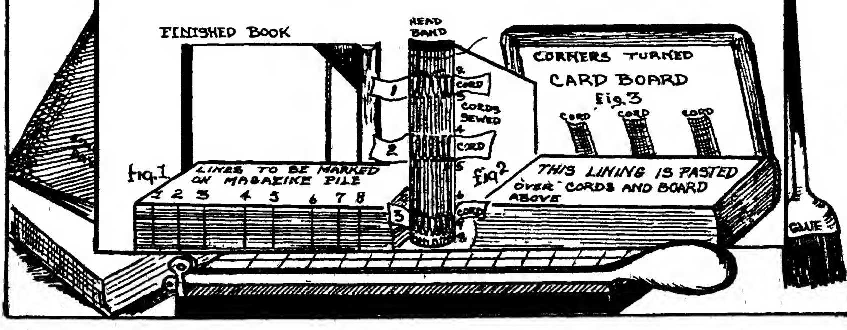
BINDING FOR MAGAZINES

closed edge glued to the first page of the first magazine and to the last page of the last magazine. Make glued space ⅛″ wide along the back edges of magazine. This makes two extra pages in the front and back of the book. Additional blank pages may be added by the same procedure.

A "tunnel" is made to fit the back of the book. Cut a paper a little shorter than the book and three times as wide as it is thick. Fold it length-wise into three folds with only one single edge exposed. Glue this to the muslin which covers the back of the signatures.

Spread hot glue over the hinge of the cover and set the back of the book in it. Close book, but not front cover, and spread hot glue over the outside of the fly-leaf and the ends of the cords. Glue this paper and the cords to inside of front cover. One-fourth inch of the leather should show on top, bottom, and front edges. Turn to back of book and fasten back cover the same way. (Fig. 3.) Close book, using wax paper to prevent second fly-leaves from sticking to those which are used for lining papers. Put the book in the press. Allow the back and ¼″ of covers to extend from the press to form a ridge. This may be done by putting heavy wires ¼″ from back on outside of cover, thus forming ridges.

Tooled designs or gold leaf may be used to decorate the book when it is dry.



Making A Book

There is only one step more, if you have gone thus far: to make a complete book of your own. Write your own copy, make your own illustrations, and then put it through the press and bind it yourself. A hand-printed book, illustrated with cuts of wood, linoleum, or zinc, and then hand-bound, will at least be an object of pride and satisfaction, and, if subject matter and execution are worthy, an heirloom of to-morrow.

All the foregoing instructions in bookbinding will have to be employed if you embark on this enterprise, particularly the section on binding magazines.

The first operation is to fold each sheet of book paper into two leaves if the book is to be folio; if quarto, into four leaves; octavo, eight leaves; and so on. When they are folded into signatures, or the number of pages that are to be used at one time, they are unfolded and numbered on both sides. Follow the chart which will be found in the chapter on "Bookbinder's Notes," or do one as a trial. After this, do your printing, if they are to be done in a press. Do not cut them apart until the book is completed.

Make the signatures into their folds again and pile them in the order in which they are to appear in the book. To use a three-cord binding, follow the directions contained in the fourth paragraph of "Binding for Magazines." Vary your measurements to suit the size of your book. Sew all of the signatures to the cords and put the muslin on the back with hot glue.

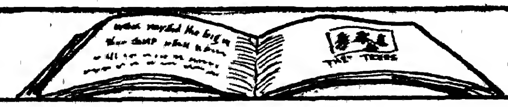
Make head bands according to directions given in the seventh paragraph of "Binding for Magazines." Attach the head bands and put the book in a press to dry.

Make lining papers and fly-leaves according to the directions in "Binding for Magazines." (See also Fig. 3 in the last-named chapter.)

Make the tunnel for the back according to directions in "Binding for Magazines." Attach this to the muslin strip which covers the sewed edges of the signatures and the cords where they are under the sewing.

For attaching the cover, see directions in "Binding for Magazines."

When the book is completed, return it to the press, being sure to use wax paper to separate all surfaces which are damp with glue. When the book is dry the pages may be cut or they may be left as they are until some one is ready to read the book.



BOOKBINDER'S NOTES

A Minimum of Equipment

A glue-pot—it may be the usual pair of small, iron pots, with the upper one holding the ground glue and water, and the lower one, into which the top one fits, containing water for use in melting the glue.

A glue brush—a two-inch bristle brush is most satisfactory.

Flour paste is frequently used, but it is neither as flexible nor as durable as hot glue.

Large needles and heavy linen thread for sewing the signatures to the cords or muslin strips.

A modelling tool to be used for folding paper and leather end forming the corners.

Wax paper, to prevent sticking when the damp materials are put into the press.

A paper cutter, to assure straight edges and faster progress when heavy materials must be cut.

Suggestions for Binding

Lining papers and end papers are frequently prepared by hand instead of using commercial materials.

Manila drawing paper makes attractive end papers by submerging it in a large pan of hot water in which shaved wax crayon has been dissolved. The oil thus formed floats on top of the water and the paper is slipped under the bubbles and then lifted. The oil sticks to the paper. This paper may be used for cover paper with contrasting leather corners and back strip.

CHART FOR NUMBERING QUARTO FOLDS

FRONT OF PAPER

TOP 16	TOP 1	TOP 4	TOP 13
9 TOP	8 TOP	5 TOP	12 TOP

BACK OF PAPER

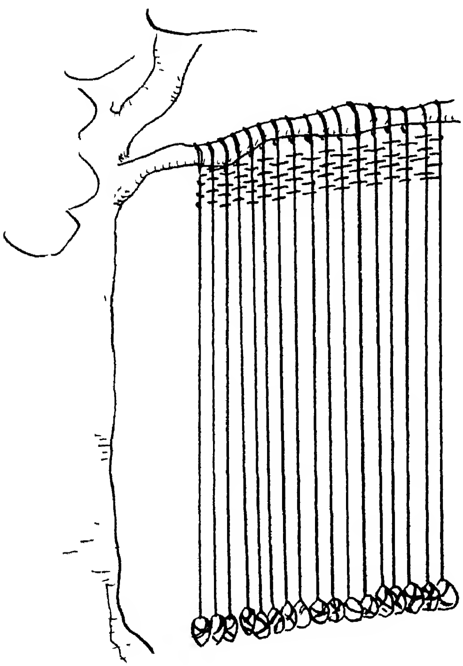
TOP 14	TOP 3	TOP 2	TOP 15
11 TOP	6 TOP	7 TOP	10 TOP

Block printing on cloth makes cover cloth. When the book is completed it is made more durable by giving the whole cover a coat of clear shellac.

The chart on this page shows how to number the pages of a quarto. This is needed when a book is printed in a press. It is not cut until after the binding is finished. To many people a book with uncut leaves is more desirable, and art crafted books are usually distributed this way.

An Introduction to Weaving

WEAVING IS ONE of the earliest of the home-crafts, and one of the most natural, arising, as it must have done, out of human necessity. One can imagine our primitive ancestors weaving boughs together to protect their caves against the elements and then getting the idea of making garments from woven rushes and grasses. One of the earliest types of loom known was made by tying the long warp strands to a horizontal bar and weighting the ends with stones or lumps of baked clay. The weights served to keep the warp strands in place. Penelope's loom was of this pattern—that loom which figured so largely in keeping at a distance an importunate lover who sought Ulysses' prerogatives while he was away on his long journey. This type of loom is excellent for teaching beginning steps in weaving or for use in camps where the warp threads may be tied around an overhanging branch of a tree.



The early weavers soon saw beyond utility to beauty; colour and design were added, and weaving became an art. In our museums we find examples of colourful and intricate patterns designed and woven by Egyptians over four thousand years ago. Some of the finest weaving of all times has been done by the Scandinavian countries and they excel in this art to-day. Modern

industrial ingenuity, with all the improvements it has brought to the loom, has not been able to equal the product of the old master craftsmen.

Hand-looming never entirely lapsed, although we can imagine early housewives, who had to spin and weave for their patriarchal families, being glad to relinquish these tasks and to buy "store goods," when textile mills became common and materials cheap.

Lately, there has been great appreciation of weaving as an art craft. It was revived in Victorian times by John Ruskin and William Morris and has had a following ever since.

If you are teaching weaving to a group, be sure to select projects which embody basic principles and instil a sense of valid craftsmanship.

All of the techniques described hereafter have been chosen because they represent steps in the development of different kinds of weaving and lead into more advanced procedure. You will find it great fun to make the looms, and there is real artistic satisfaction to be had in designing and weaving things for yourself.

WEAVING TERMS

Warp—the taut lengthwise threads which are the foundation of the work. In some types of work, however, the design comes from the warp and is called a "warp pattern."

Weft—the cross-wise threads which go over and under the warp, making the fabric and the pattern. Woof is another name for weft.

Web—the material woven is sometimes called the web.

Heddles—small cords or wires with eyes through which the warp threads are passed.

Shuttle—an instrument on which the weft thread is wound. It is used for sliding thread back and forth in weaving.

Shed Stick—a flat piece of wood or cardboard passed between the warp threads before starting to weave. This keeps the warp threads in place while weaving.

Shed—a V-shaped space between the warp threads where the shuttle is passed.

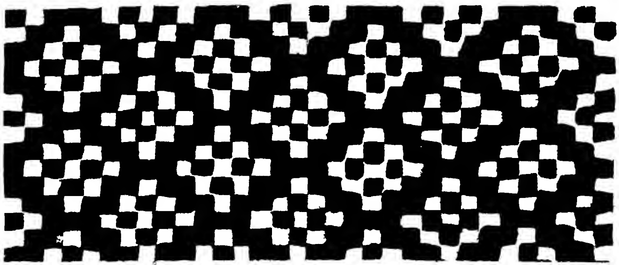
Loom—a weaving frame.

Beater—flat stick with which each row of weft is "beaten" after it is shot through the warp, to make the work firm and even.

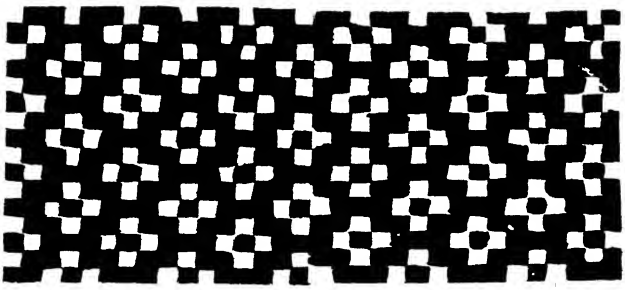
PATTERN WEAVING

Weaving reduced to elementals is simply going over and under taut thre with weft threads and thus creating a webbing. This simple kind of we ing is known as "tabby," and many of our most common fabrics are in this way, such as calico, or muslin, as examination will show.

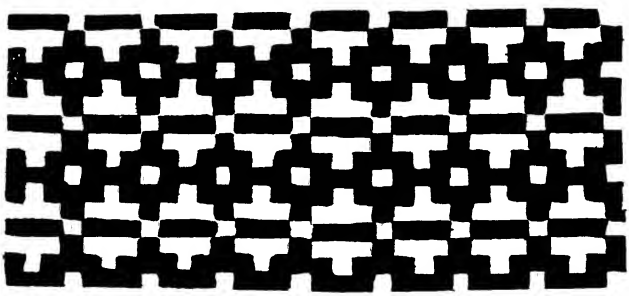
The pattern arises from colour arrangements against a background. most weaving the warp is the foundation and the pattern is made by weft threads, but there are some exceptions, as you will see later in chapter.



Small Squares



Flower Garden



Irish Chain

Fig. 1—Traditional Patterns

The illustrations given here show some traditional designs. (Fig 1.) To make your own designs, get some graph paper, or rule a piece of paper in squares, according to the number of warp threads, and the width of your work. Each square represents a warp thread. Now, suppose you are having a neutral background and are using a dark colour for the weft. Block out your design by colouring the squares to form your pattern. The pattern is always put in with the over stitches.

In the Flower Garden design illustrated, for instance, you can see that the weaving would go like this: Beginning at the right: Weave one row plain (this does not appear on the graph) then, the second row, from left to right will be under one, over two, all the way across. In row three, right to left, you will go under one, over one, under one, over three, etc. If you want to try out your colour effects, use crayons or water colours, or even coloured kindergarten papers

THE CARDBOARD LOOM

On a cardboard loom you can make small articles—utility bags, book carriers, purses, etc. The principle is simple enough for children, and yet it is possible to carry out elaborate ideas and designs on these looms and to exercise your creative faculty.

Materials

Woolen yarn—(four-ply worsted is about the right weight), silk yarns, cotton or linen yarns, jute (for camp projects), raffia, leather thongs. Scrap materials—cotton or woolen rags, and felt cut into quarter-inch strips. Woolen rags must be cut narrow and woven on a larger loom than lighter weight materials. Cut cotton rags about one-half inch wide and sew them together by overlapping the sides, as carpet rags are sewed. Your warp must be chosen according to the weft, carpet warp for cotton or linen, silk for silk, wool for wool, etc.

A CARDBOARD LOOM FOR A SEAMLESS PURSE

Cut two pieces of cardboard the exact size you wish to make your purse and paste them together. (Fig. 2.) This double thickness will make your loom strong and give you a place to stick your pins. Paste scotch tape over the top, where the pins are to go. Then put in your pins, one-eighth inch to

one-quarter inch apart, according to the thickness of the warp you are going to use. Use a pencil and ruler, to make sure that your pins are evenly placed.

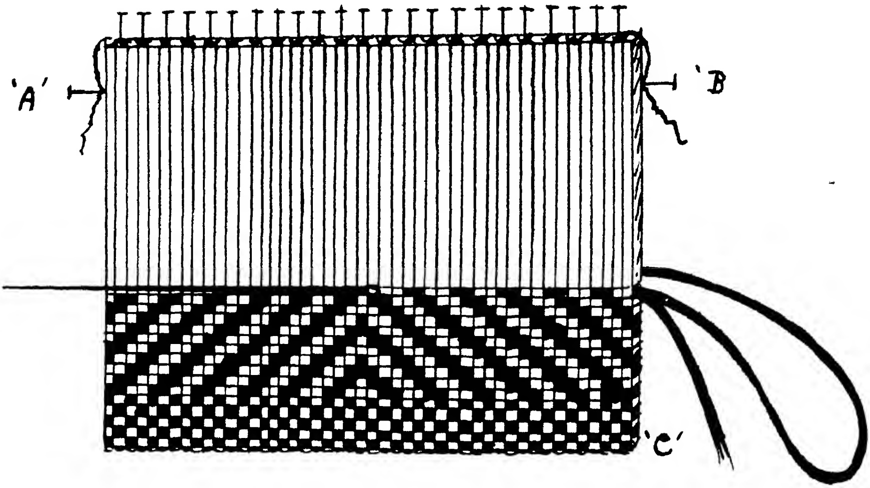


Fig. 2—Cardboard Loom for a Seamless Purse

To String the Loom

Fasten end of warp with a pin to left side of loom about 1 inch down from the top. (A, Fig. 2.) Then take the thread up and around the first pin, going from left to right and carry it to the bottom of the loom and up again on the other side, hooking it over the same pin again from left to right. Bring thread down again on back of loom to the bottom and up the front to the second pin. Continue until all the pins are wound, and end by pinning the warp to the right side of the loom, placing the pin about 1 inch from the top, as on the other side. (B, Fig. 2.)

To Weave

Thread your weft thread into a long heavy needle, and begin weaving at the lower right-hand corner of your loom and continue until you are all the way across. (C, Fig. 2.) Then turn your loom over and weave again until you are back where you started. Continue weaving around and around the loom until the project is completed. Keep the warp threads straight with your needle and beat down the woof threads with a needle or with a tongue depressor for beater. If you want a design in stripes, change the colour of

your woof by splicing the thread. You can join a new piece of thread in the same way or else leave an end and weave it in when the article is finished.

Finish the top of your bag with a zipper, or whatever manner of fastening appeals to you. Steam and press your work so it won't curl.

VARIATIONS

Purse with Flap (Fig. 3).

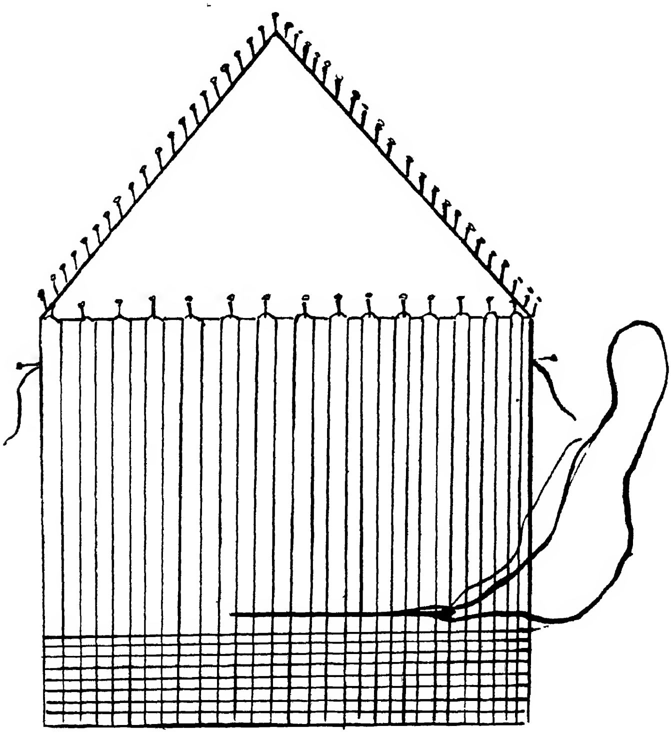


Fig. 3—Purse With Flap

Cut two pieces of cardboard the exact size of the triangular top which is to be used for the flap. Paste the two pieces together, attach the square with glue and then place pins across the top of the straight piece, and around the flap, and carry your warp from around one pin down front of loom, then up back to the pin on the flap. Repeat until pins are filled, one loop for each pin.

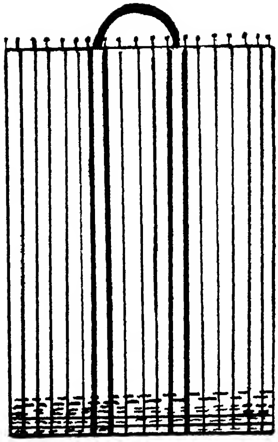
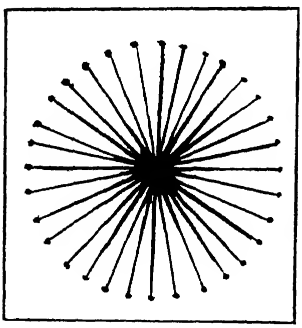


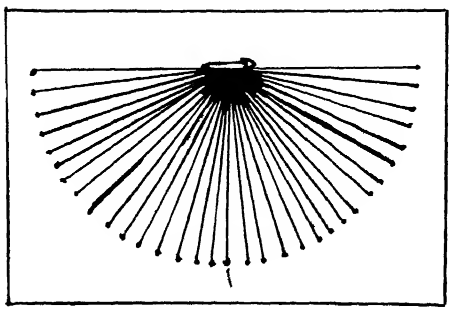
Fig. 4—Shopping Bag Loom

Shopping Bag—(Fig. 4). Cut three pieces of cardboard the size of the bag and paste them together. Place pins across top of loom and then make handle by using the monk's rope stitch. You will need the string for your handle twelve times the length of the loom. Find centre of string, tie a slip knot, and make enough monk's rope for one handle. Then pin the handle to centre of loom in the right position, and bring the two long ends down front of loom and up back to place for second handle. Make another handle on same piece of string—fasten both ends to handle position with pins. Bring two remaining ends down back of loom and up right side to first handle and tie them fast. Include the long ends in your weave to make the bag strong. Coloured jute makes good looking, strong shopping bags. (Directions for making monk's rope will be found later in this chapter.)

Mat Loom and Purse Loom



Mat Loom



Purse Loom

Fig. 5

Fig. 5 shows other types of cardboard looms that are easily made.

The warp is fastened near the edge of the cardboard, passed through small holes, then through hole in centre, etc. Weave the weft threads around

and around. There should be an uneven number of warp threads to allow for continuous weaving.

THE ONE-FRAME LOOM (Fig. 6)

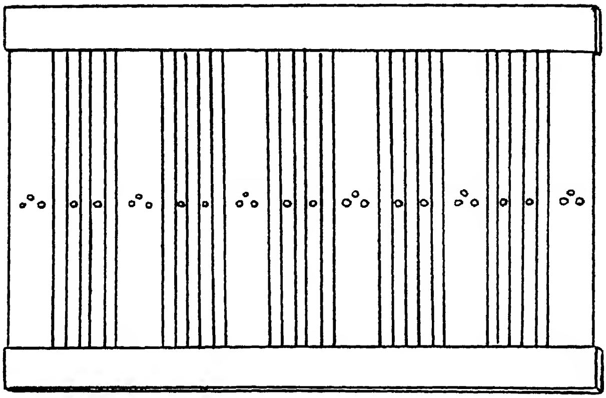


Fig. 6—Loom With Unstrung Heddles Showing Holes

On this loom you can make narrow bands for various uses by stringing only a few of the heddles in the centre of the frame, or, by stringing the complete loom, it is possible to make mufflers, table runners, place mats, and other objects the full width of the frame. This simple contrivance embodies the principle of the four-harness loom, and it is an excellent approach to full-fledged weaving work.

Construction of the Loom

The frame is made of two pieces of wood, 12″ × 1″ × ½″. These basic pieces are joined together by the heddles. The wider heddles are made of tongue depressors. The narrower are of strong splints, or of tongue depressors cut in two. Groove the two 12″ pieces of wood on one side, so that the grooves will match top and bottom, and into these grooves glue the heddles. They should be about ⅛″ apart. Bore three holes in the large heddles and one in each of the small ones, so that the holes make a straight line along the centre of the frame.

The wide heddles are put in to vary the pattern. They, as you will notice in the illustration, have three holes each. When all of these holes are threaded, three warp threads can be carried together, thus making a heavy stripe in the weaving. If you want a plain weave, thread only one of them.

To String the Loom

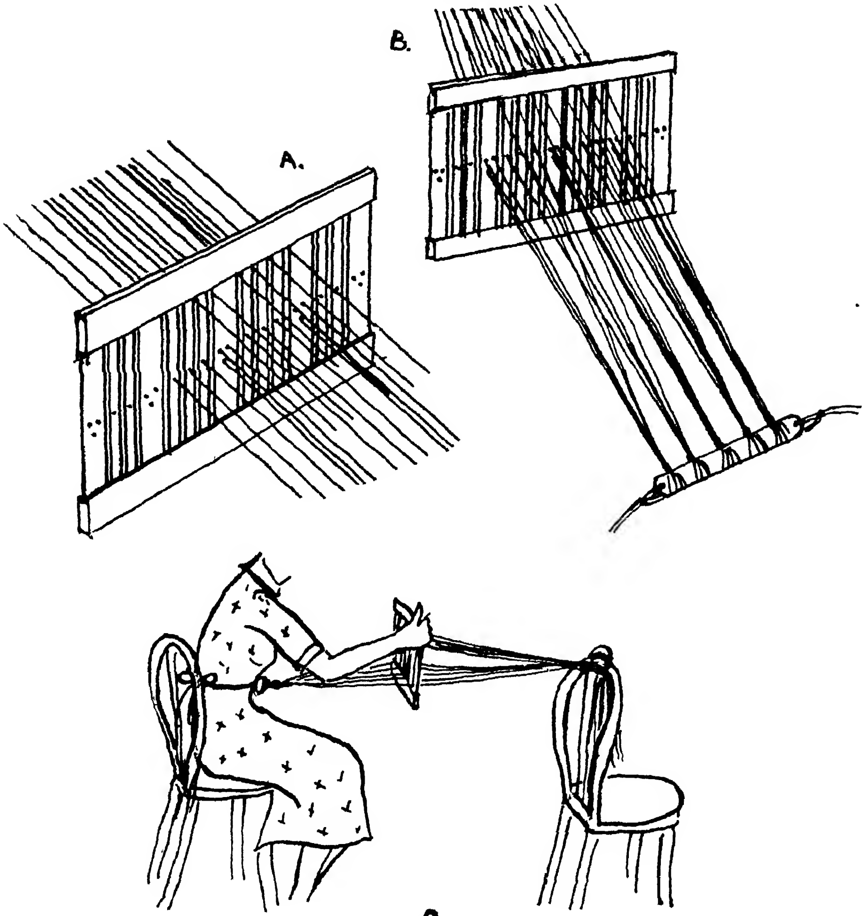


Fig. 7—Weaving on One-Frame Loom

Decide on the length of the finished article and cut your warp threads twice as long. This allows enough extra thread to attach to your waist and to a chair for weaving. (C, Fig. 7.) String the loom by threading warp thread through the holes along the middle of the loom, and also through the slits between the heddles. (A, Fig. 7.) String the entire loom for a scarf and only the centre for a belt. Tie all ends on one side of the loom to a piece of wood eight inches long and bore a hole in each end. Threads may be tied in groups of four or five instead of singly. (B, Fig. 7.)

To Weave

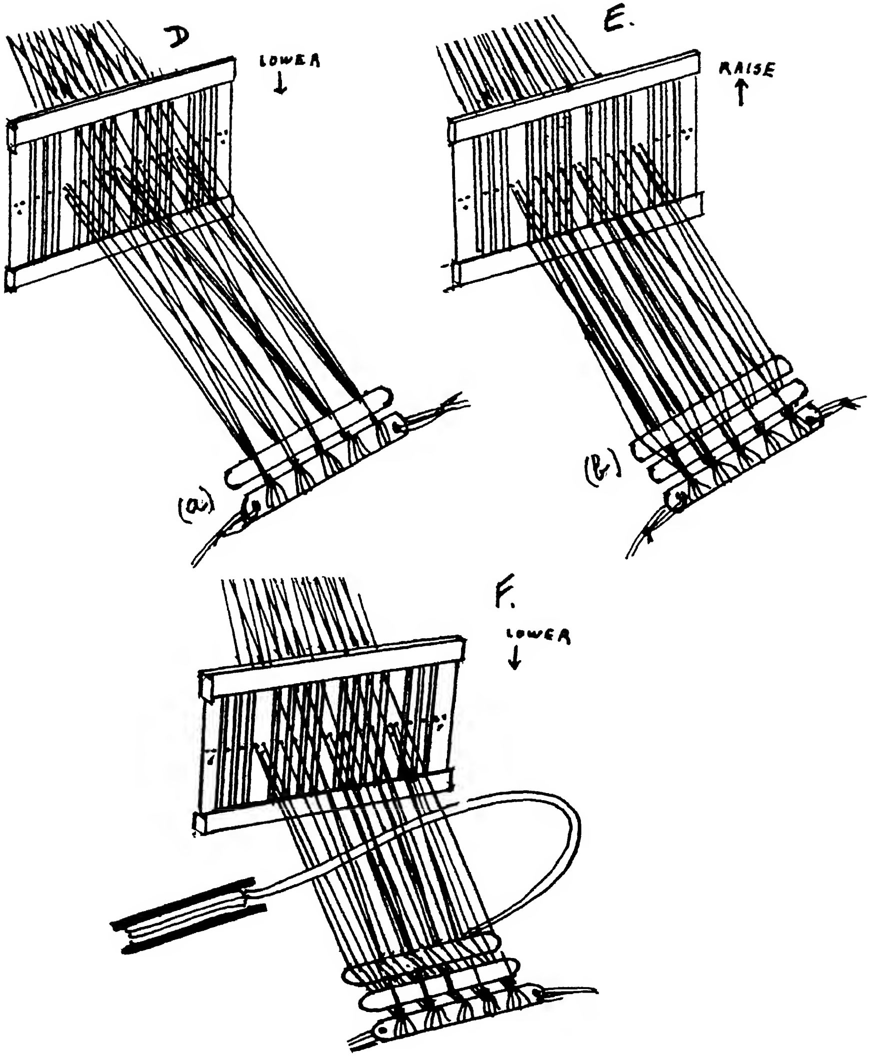


Fig. 8—Weaving on One-Frame Loom

Attach stick to your waist by placing string around waist and running it through the hole in each end of stick. Tie the other end of the long strings to a chair, to hold your warp taut for weaving. (C, Fig. 7.) For a bedridden person, the strings may be tied to the foot of the bed instead of to a chair.

Press the loom down This causes all threads in the holes to go down and the ones in the slits to come up, thus forming a shed. (D, Fig. 8.) Insert a small stick and pull down towards your waist. This will be a "spreader." (A, Fig. 8, D) Now pull up on the loom. This will raise up all threads in the centre holes and lower all between the heddles. Insert another small stick for a second spreader (b, Fig. 8, E.) You are now ready to weave. Wind weft thread on your shuttle. Lower loom and pass shuttle between threads coming through the holes and those between the slats. This space is called the shed. (F, Fig. 8.) Beat thread down into place with tongue depressor or 6 inch ruler. Continue lowering and raising the loom and drawing weft thread through shed each time until weaving is completed.

THE BARREL HOOP LOOM (Fig. 9.)

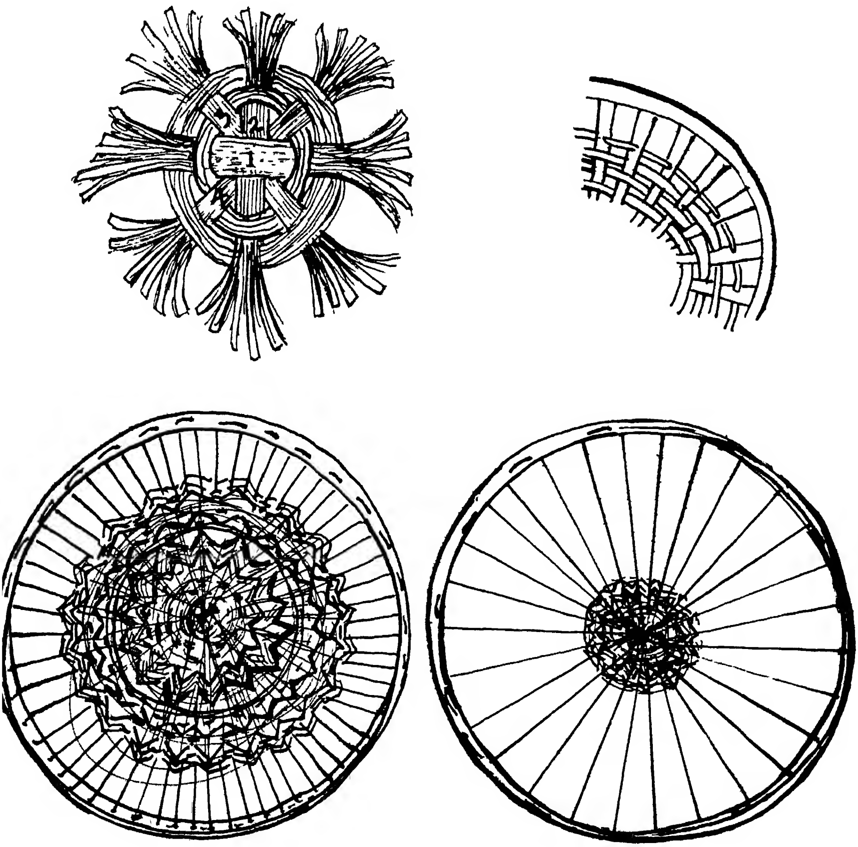


Fig. 9—The Barrel Hoop Loom

The barrel hoop loom is used for weaving circular mats. It is an excellent camp activity, and also pleasant out-of-doors handiwork for summers at home. The loom can be suspended from a branch of a tree, or attached to the side of a cabin, or to a porch railing, while working.

Because of the lightness in weight, it can also be held in one hand, with the lower half resting in the lap. This loom is fine for teaching young children the beginning steps in weaving, as the warp is farther apart than in any other loom, and this simplifies the technique. Another point of merit is that articles can be finished in a very short time.

Materials

Warp—Almost any kind of string or carpet warp can be used for threading this loom. Whatever is chosen should be strong, for it has to be stretched very tight to keep the mat from cupping in the middle when removed from the loom. Additional strain is given, too, when the weft thread goes in and out, for the warp thread is generally much thinner and not quite as strong as the woof.

Weft—Rags or silk stockings make excellent materials. They must be cut into strips, as for carpet rags. Cut them about three-quarters of an inch wide and sew them together. They dye easily, so you can control your colour scheme.

How to Thread the Loom

First you must bore holes around your hoop. Bore one hole and then another just opposite. Put a temporary string across, and then measure your circumference. The holes should be two and a half or three inches apart, and there must be an uneven number to allow for continuous weaving. Mark them off and bore the holes. Use double warp thread. Thread it through with a large needle, and tie a knot at the end. Begin stringing by thrusting the needles through from outside the hoop towards the centre, and straight across to the opposite hole. Then go through the next hole, from the outside on right to hole on left on opposite side of your first warp thread and so on. You will have to thread your needle several times. Each time be sure to fasten your end with a large knot on the outside, and begin as you did the first time. This is so that, at the completion of your work, you can cut the warp threads and have enough left to fasten securely. When you have finished your loom, it will look like a wheel with spokes, as shown in the illustration. Tie the last end to the first.

How to Weave

With the left hand, hold the warp firm in the centre and attach woof thread by tying it to threads where they cross in the centre. Weave with the right hand. First, divide the warp in four parts where it crosses and weave around each part two or three times until the centre is tight and smooth. Then gradually divide the warp into eight parts, and so on until you are weaving over and under each warp thread. Continue weaving until you have your mat the desired size. On the last row, weave between your double warp thread. Remove mat from the loom by cutting the outisde threads. You should have several inches of warp left. Flatten out the mat on a table and tie each doublewarp thread with a square knot and then weave the ends up several inches into the mat. Steam it so it will lie flat. Line it with cretonne or burlap, so that it will hold its shape and be very durable.

EGYPTIAN CARD WEAVING

Card weaving is a special technique requiring simple equipment which can be easily made or improvised, once you have caught the idea. The warp must be fastened at both ends to horizontal bars which will hold it steady and taut as you work. The frame illustrated below can be made very cheaply and we recommend that you make one if possible. (Fig. 10.)

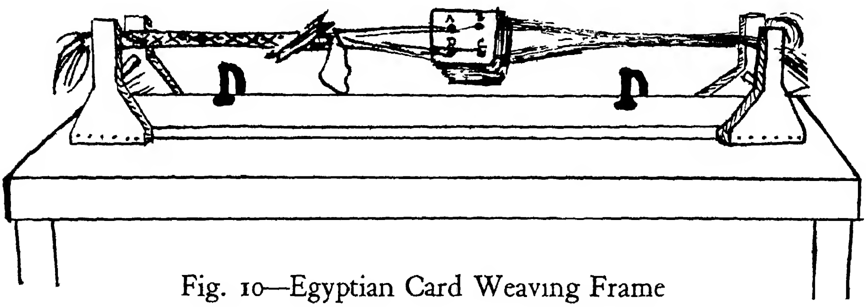
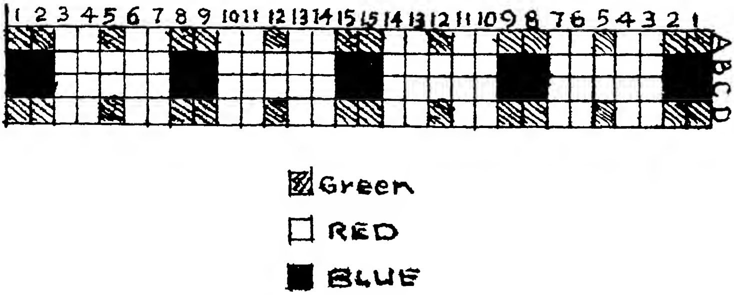


Fig. 10—Egyptian Card Weaving Frame

This craft is usually referred to as Egyptian Card Weaving although, like most primitive arts, it was practised in many countries in all parts of the world.

However, so far as the modern handicrafter goes, it did come from ancient Egypt. Archæologists found in several tombs sets of thin tablets or cards of horn. These tablets were perforated in the corners and contained curious

markings, and it was concluded that there must have been a game which was played with them. Finally, in one tomb, a complete tablet weaving apparatus was discovered, set up as if for use, and holding a partly finished girdle, with cards threaded with brightly coloured silk strands. From this discovery came our modern card weaving.



The principle of this technique is similar to the four-harness loom, the cards acting as heddles, each rotation creating a new shed, as when the harnesses of the foot loom are raised or lowered by the treadles. It is possible to weave strips up to about five or six inches in width for belts, hat bands, dress trimmings, book markers, bell pulls, and other such articles. The width of the ribbon will depend upon the number of cards used and the ply of the thread.

The texture of card-woven fabric is quite different from other weaves, for instead of the warp and weft threads making a sort of basket weave, under-and-over effect, the warp threads are twisted by the turning of the cards and the weft thread shuttled through the sheds holds the warp in place, giving a smooth, satiny finish. The pattern comes from the warp, and intricate and beautiful designs can be made. There are a number of traditional patterns which can only be found in large or special library collections as a rule, or in the files of enthusiastic amateurs. We give above an original pattern, which will serve to familiarise you with the principle. When you understand how the patterns are derived, you will be able to make graphs of your own.

Fig. 11—Shuttle

A small, flat shuttle, six to eight inches long and an inch and a half wide, is used for carrying the weft and for beating your work. (Fig. 11.) Shuttles

should be made of hard wood well sand-papered, so that they will not rough up the warp.

Materials

Mercerised cotton crochet and knitting yarns are the best to use for card weaving. Carpet warp is suggested for your first experiments as it is cheap and good for trying out designs. Examples of fine Arabian and Persian work in museums are made of silk warp shot with silver and gold threads.

The ply of the thread and the number of cards determine the width of the work. Twenty cards threaded with carpet warp or number five perle cotton will make a strip about one and one-half inches wide.

Bright, high colours and bold designs are most effective. The patterns depend chiefly upon colour, and the strong tones work up better than softer shades. There are some beautiful examples of Egyptian work left to us, and their characteristic designs are especially lovely for this kind of weaving.

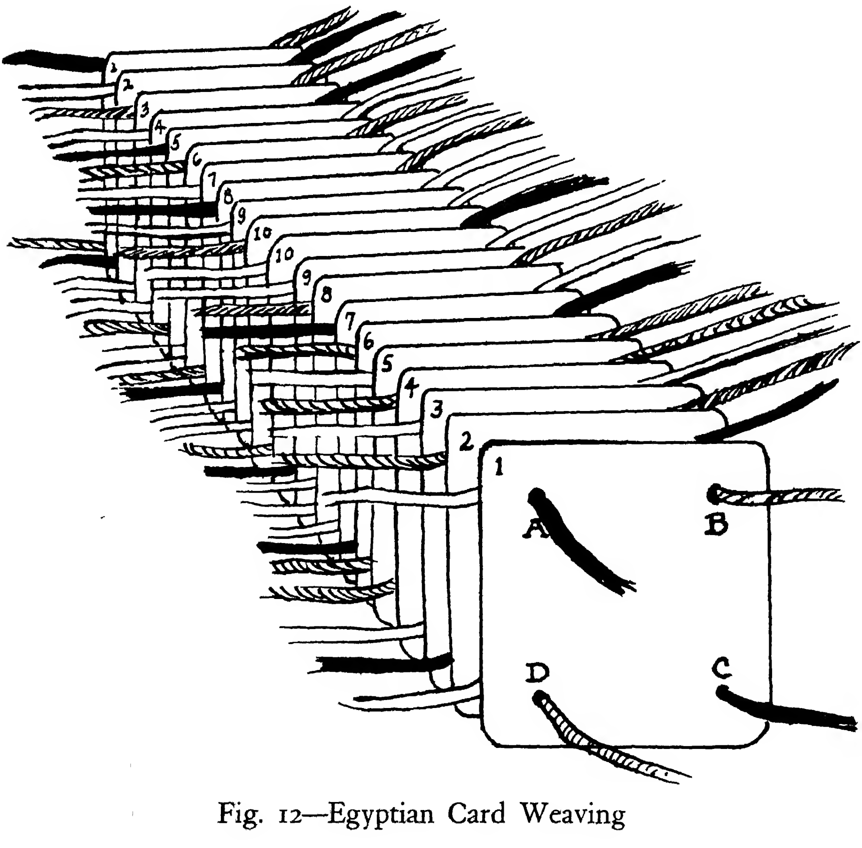


Fig. 12—Egyptian Card Weaving

However, in this as in all creative enterprises, individual taste and originality should be given play, so that new forms and patterns may be developed.

You can make your own cards or buy them at a handicraft shop. Old playing cards can be squared and punched with holes or, if you have stiff cardboard, measure off three-inch squares and make as many cards as you need. The holes should be about half an inch from the corners and large enough to allow the thread to slip through easily. Fig. 12 shows the cards threaded. You will note that the holes are lettered A, B, C, and D, clockwise. The A position is usually the control or key position, from which you count the turn of the cards

Procedure

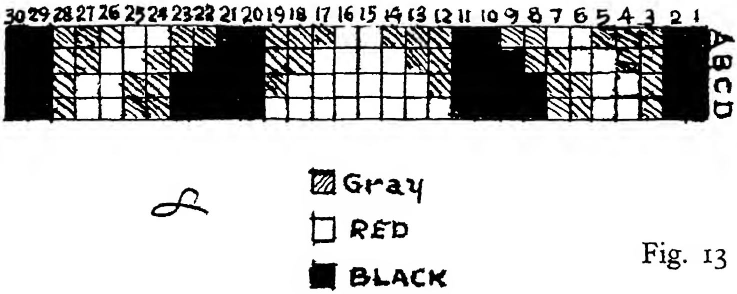


Fig. 13

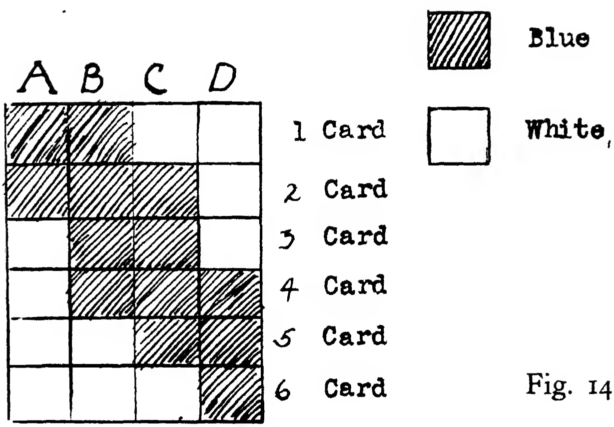


Fig. 14

Figs. 13 and 14 are graphs of original patterns. After following one of these, according to directions given below, you will be able to follow any pattern.

First select your colours. Two high colours, bright red and bright green, and a softer shade—white or pale gold, or other combinations of equivalent colour value, are effective in these designs. The graphs show how many threads of each colour must be measured off. Allow three times the finished length, plus six or eight inches extra for tying the warp to the frame.

Measure off your warp threads, laying them carefully across a table, the colours separate. Follow your diagram for threading the cards, laying them face up, one on the other in order, as you thread them. Draw the threads through evenly, leaving a shorter length—about eighteen inches—on the left hand side.

Card number one should be on the bottom when you have finished threading.

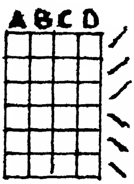
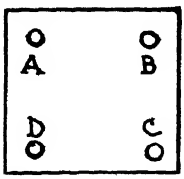


Fig. 15

The two patterns illustrated call for the cards to be threaded all one way. Most graphs have, along one side, small diagonal marks, some going one way, some another. (Fig. 15.) The strokes from right to left mean that the cards are to be threaded "up," those from left to right that they must be threaded "down."

All threading is from the face side of the cards, however. When "up" is indicated, hold your thread in your right hand and let it run that way. For the "down" threading, hold your thread in your left hand and let it run in that direction.



It is a little difficult for the beginner to understand the difference in threading up or down but it does influence the pattern. Each single card, however, must have every thread going the same way, or weaving would be impossible. (Fig. 16.)

When the cards are all ready, straighten out the warp with your fingers at the shorter end. It is good to fasten the cards together with elastic bands while you are doing this, or else have someone hold them in place for you. When the warp on your left-hand side is straight, tie it onto the bar. Then straighten the other threads and tie them fast, having them very taut. The cards should be in the centre of the warp and should move freely back and forth.

You will need four tongue depressors or four pieces of cardboard of about the same size for shed sticks.

If your cards are properly set up and your warp even you will have a clear shed. Put the first depressor in the shed at the left as near the bar as possible,

and give the cards one turn to the left, from "A" position to "B" position. Put in your second spreader, again as far to the left as it will go, and give another turn, and so on until you have marked all your sheds. Now you are ready to weave.

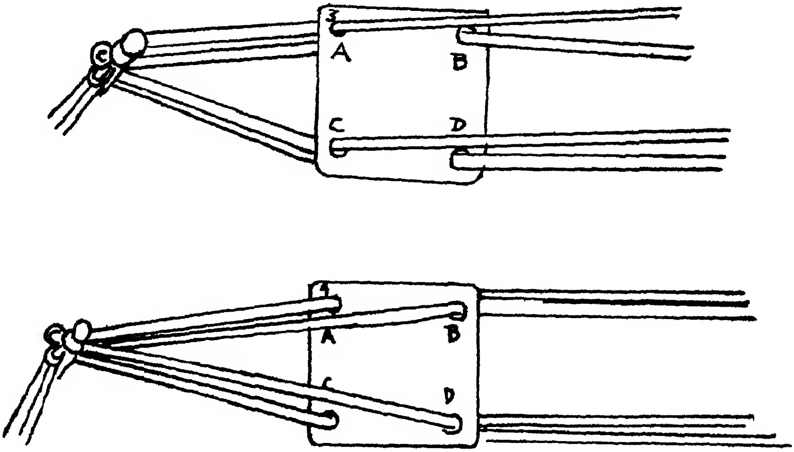


Fig. 16—Top card is threaded "up," or right to left. Bottom card is threaded "down," or left to right.

Your shuttle should be wound with enough weft for the whole piece. The weft should be the colour of the border, so that it will not show. If, as in Fig. 13, the first two and last two cards are threaded all with one colour, that will be your border shade.

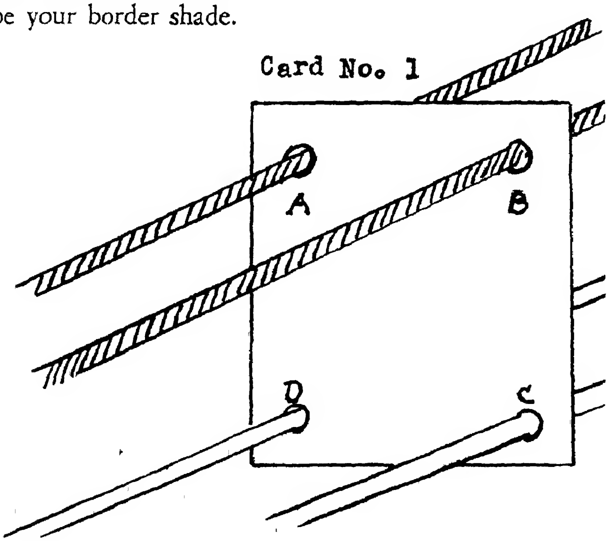


Fig. 17

Draw the weft thread through your shed near the last spreader. Now give your cards a turn from "A" position to "B" position. Bring your shuttle through the new shed and beat your work well. Make another turn of the cards, and put in another shot of weft, and so on until you have returned to the "A" position. Now reverse, and weave in the opposite direction for four turns Continue this process until your strip is finished. Each time you draw your weft through, put your shuttle into the new shed in the opposite direction, ready for the next turn of the cards. Then pull the weft through using your two hands, before beating your work.

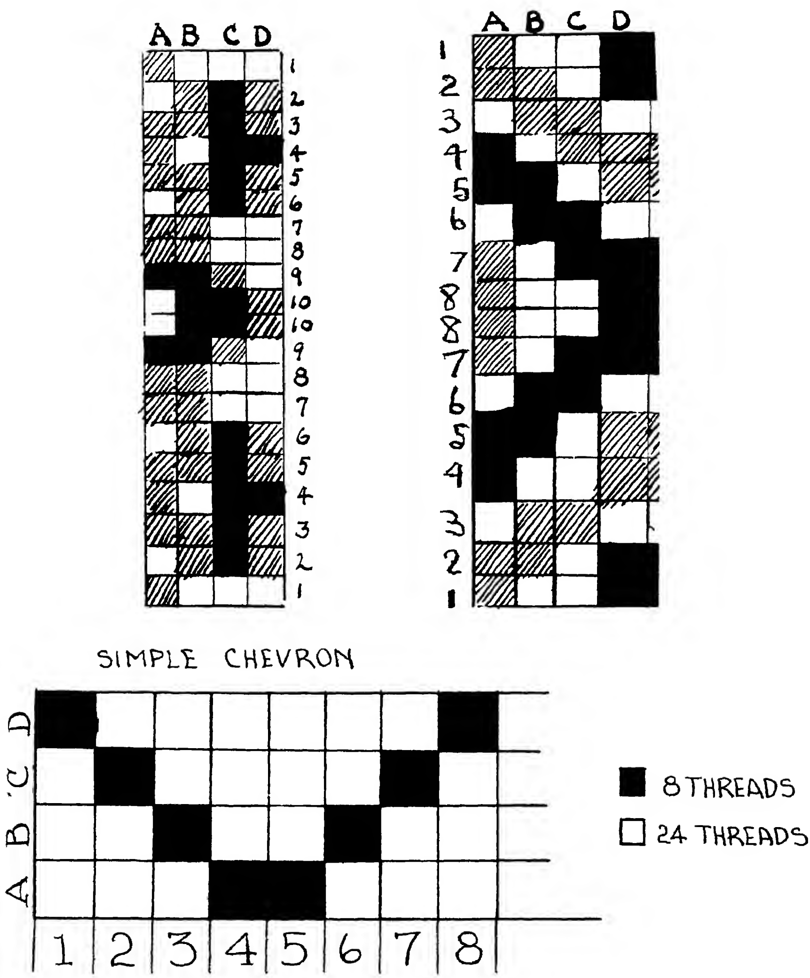


Fig. 18—Three Conventional Patterns

If your warp becomes too tight or too slack, you can undo it at the right hand side and adjust it. Your weaving will come up on the left hand side.

Beat your work well after each shot of weft. This makes it smooth and even. Try to turn your cards all at once by placing the palm of your right hand under them and shifting them gently. If any of the cards stick, use your fingers to right them. Check them occasionally to make sure that your "A"s and "B"s are in proper position. Before putting the shuttle through each new shed, run your index finger through to see that it is clear.

The customary way of weaving and the easiest is to make four turns one way and four back to the original position. This is the Egyptian technique. In this way your warp will never become twisted. However, some of the traditional patterns call for turning the cards by different schemes of rotation. Should you try any of them and find your warp becoming twisted, untie it and comb it out.

Fig. 14 is an original pattern requiring thirty cards. Wider strips and more elaborate patterns sometimes call for fifty or even as many as ninety cards, but you will find these easy enough to manage once you have got your start in this technique.

Try making one strip with, first, the four turns each way. Then try two turns each way. Now turn several cards one or two turns, and then put your shuttle through, noting the effect on your pattern. In this way, you will learn how to graph designs and how to arrange colours for any desired effect. Yet there is always the element of suspense and surprise to urge you on.

When you have created a design worthy of repetition, be sure to attach a sample to your graph for identification. (Fig. 18.)

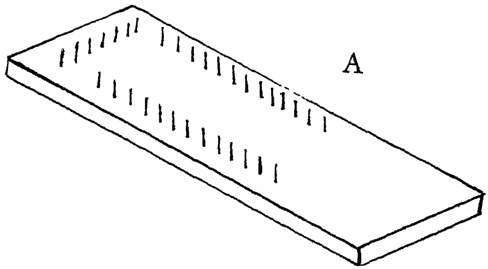
HUNGARIAN LOOM

This loom is suitable only for weaving strips in varying widths. With it, you can make belts, headbands, scarfs, bags, etc. Articles made on this loom are twice as heavy as those woven with other techniques, and they can be handsome when woven in pleasant colours and patterns. Belts are thick and firm and they do not stretch. The weaving itself is simple and can be done by young children.

Materials

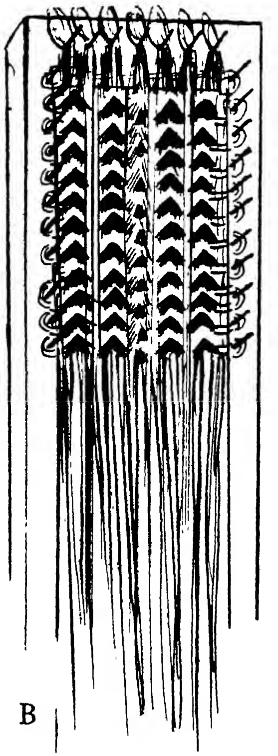
Yarn is the most satisfactory material. Candlewicking may be used for making summer belts, and jute for camp work.

Construction of Nail Loom (A, Fig. 19).



A

The loom may be made in any size according to the article you wish to make. Cut a board about one and one-half inches bigger each way than the loom you plan to make and draw lines inside outlining the working area. Use one inch brads and place them one-quarter inch apart along the three sides as shown in the illustration. Sandpaper the board well, so that the yarn will not be caught by splinters.



B

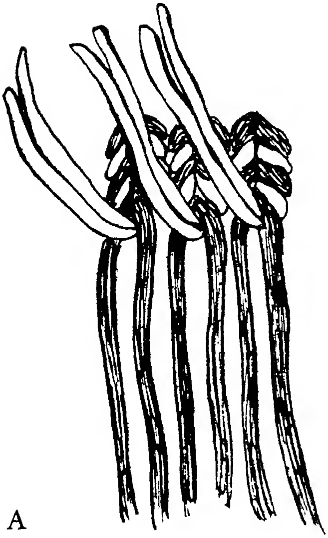
How to Weave (B, Fig. 19).

In measuring the warp, allow three times the finished length. Fasten your warp threads to the brads at the narrower side of your loom. Have an uneven number of brads and to each one attach four warp threads. This is a warp-pattern type of weaving, so your colour and design will come from the lengthwise threads.

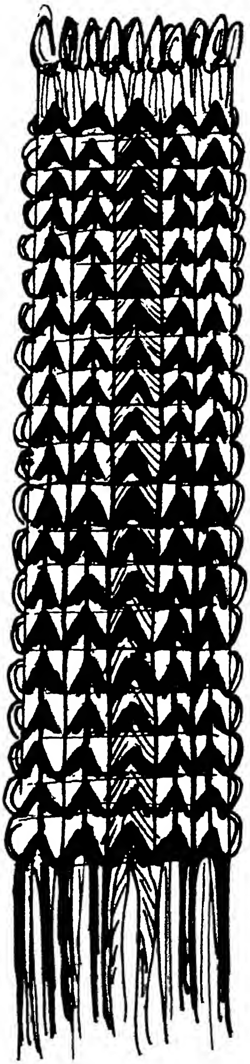
Tie a string around the warp threads to hold them securely.

Fasten the weft thread—which should be of woollen yarn—to an extra brad in the upper right-hand side of your weaving-board, and tie it in with the warp threads.

1st row—Pick up two warp threads in each set of four. Hold them high enough to pass through the ball of woollen yarn which is your weft. Pass the ball around the first nail on the left side, back and around the first nail on the right side. In working your weft around the nails, pass it around and below the left-hand nail and above and around the right-hand nail, thus carrying the weft back and forth.



A



B

2nd row—Separate the two top strands in the first row on the right and pick up the lower strands in the set of four. Pull them up between the top two and throw them back over top of frame and out of the way. (A, Fig. 20.) Do the same to each succeeding set of four strands across the loom, and then bring the wool thread back below first nail on the left. Continue weaving in this way until your strip is completed.

When you have finished the last rows on the loom, slip the woven piece off the nails and move it up, replacing it on the loom, putting the last two side loops at the top side nails. Continue as before, weaving and moving the strip up on the loom until the desired length is attained. (B, Fig. 20.)

Fig. 20

If you are using a buckle, sew it on by bringing the warp threads through the buckle, clip the ends and cover with a small piece of material as near the colour of the belt as possible and stitch down on the wrong side, fastening the woolen ends securely.

ELEMENTARY TAPESTRY WEAVING

When you have mastered some of the simple weaving techniques described earlier, you will enjoy working out an elementary tapestry design. On an improvised loom you will be able to weave such things as wall pieces, hand bags and pillow squares A number of tapestry squares could be joined together for a rug. This would be a good enterprise for a group.

A handy and serviceable frame can be made from the end of an orange crate with the sunken section removed. If an orange crate cannot be procured, a strong picture frame or a small canvas stretcher will do equally well. You can, of course, use new, sturdy materials, and sound joining techniques for a really substantial tapestry loom.

The square frame in each case should be well sandpapered. Hammer in small nails about one-half inch apart at one end. (Fig. 21.)

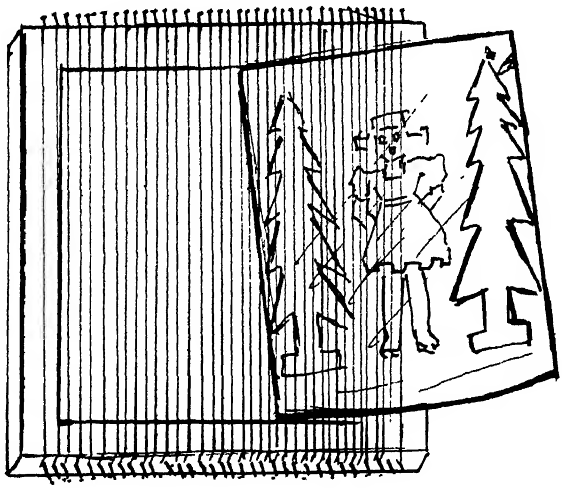


Fig. 21 Elementary Tapestry Weaving Small Frame

To Make Your Design

First take a large sheet of mounting paper or wrapping paper and plan the actual size of the piece to be woven. Your tapestry will, when finished, be about three-quarter inch smaller than the inside measurement of your frame. Cut your design from coloured paper and paste it on the mounting

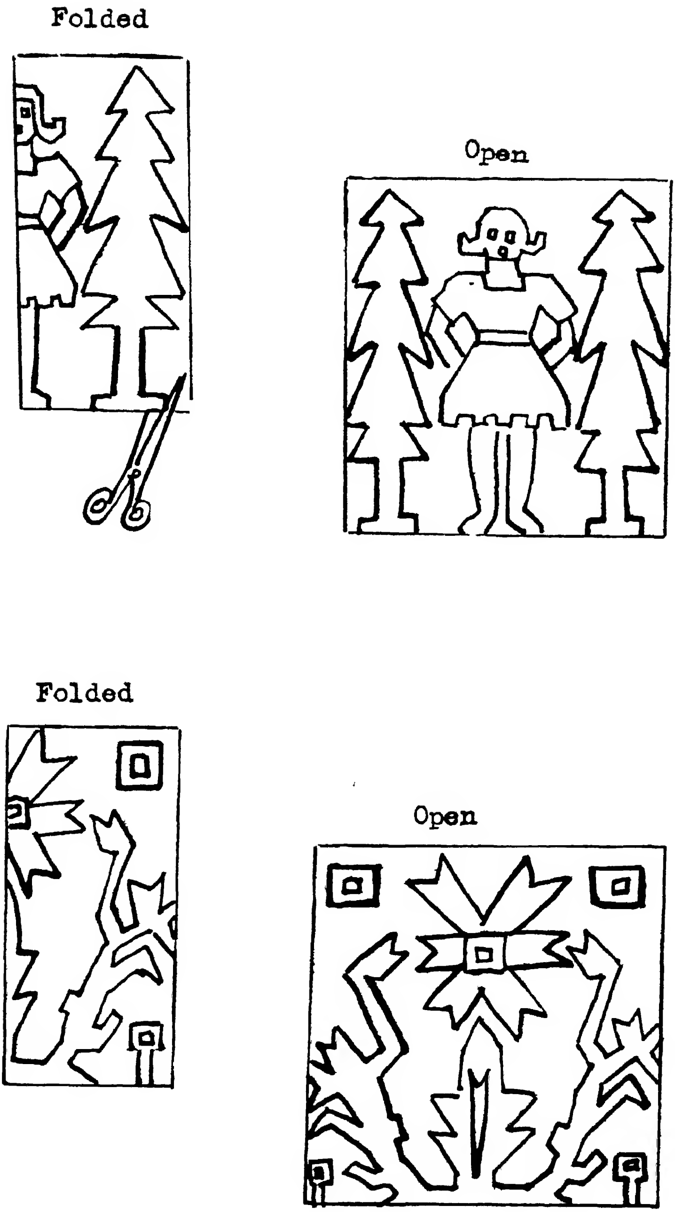


Fig. 22—Elementary Tapestry Weaving Designs

paper. Fold the coloured paper in half, draw half of the design and cut it on the fold. (Fig. 22.) It is important to remember that curved lines cannot be woven and that therefore the pattern should be confined to horizontal, vertical, and diagonal lines. Bisymmetric patterns are easy to develop and they are very effective. The cut-paper design method gives interesting, varied patterns and requires no graph work.

The loom is strung with warp thread—carpet warp is recommended, but string may be used if it is stout enough. Tie your warp around the first nail and wind it tightly around the loom, with two threads in line with each nail, and an uneven number of threads in all. It is best to wind the thread completely around the loom rather than only around the nails, as the nails might loosen and fall out, dropping the warp threads. By this double stringing, a tapestry may be woven on each side of the loom, and the two cut apart upon completion. You must keep the warp taut. Tie the warp around the last nail and then you are ready to weave. (Fig. 21.)

Several needles of various lengths are needed as shuttles. Whittle them from one-quarter inch or three-eighth inch dowel rod. Drill an eye in each with a hand drill, whittle a point at the other end, then sandpaper the entire needle. (Fig. 23.)

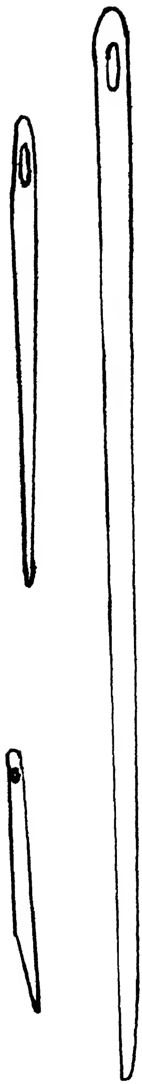


Fig. 23.—Needles

Slip your paper design behind the warp threads. (Fig. 21.) The back threads will hold it in place. About eight rows of warp should first be woven in (over one, under one) before the design is started. As you weave, be sure to beat the weft down well with an evenly spaced comb.

Use medium weight yarn. The design may be woven in first, and the background filled in later. However, you will get a more even weave if the work is woven row by row. Do not pull the warp threads too tightly together in spots or you will have an hour-glass effect in the finished piece. Uneven tension is a common fault of beginners and it takes practice to over-

come it. Watch the margins of the design and keep the warp threads perfectly parallel and you will avoid this fault. In filling in one colour next to another, where vertical lines are being shown, the two weft threads must loop over the same warp thread. (A, Fig. 24.) Have several small needles threaded with all the colours you use in the design and keep the weft threads unbroken until each colour unit is complete. (B, Fig. 24.)

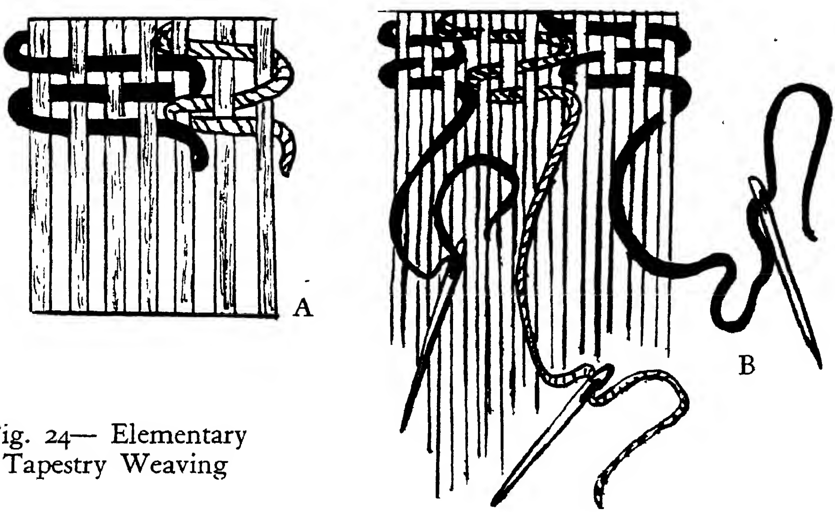


Fig. 24— Elementary Tapestry Weaving

THE BEAD LOOM

Here is a satisfactory bead loom, without rollers. By winding the warp around the loom as shown in Fig. 23, A, the loom need be only half the length of the finished article, as the woven part can be pulled around so it will be underneath the loom. Thus, a belt loom should be twelve to fourteen inches long, and one for head bands or bracelets only half this size. Such a loom can be made in any length or width, according to the article you wish to weave.

To Construct Loom

Cut two one-half inch boards for sides the length you wish to make your loom, and shape them as shown in Fig. 25, A. The depression along the side is to allow freedom for fingers while working. Cut two pieces for the ends from one-half inch boards, the same height as the end of the side pieces, and

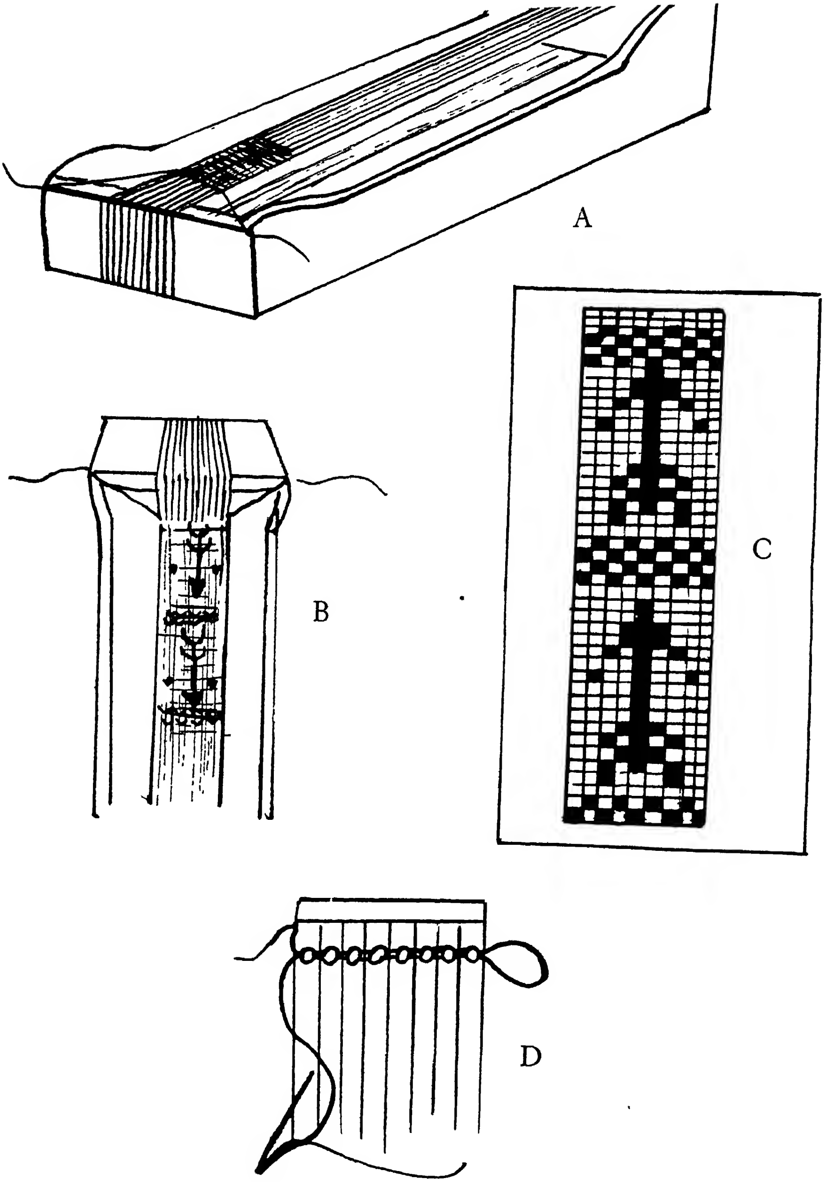


Fig. 25—Bead Loom

as wide as you wish the loom. Fasten all four pieces together with glue and small nails. A small loom can be made from a cigar box by taking off the lid and the bottom and shaping the sides with a saw or a knife.

To Warp the Loom

Thread is usually used for warping this loom. Fasten one end in the left-hand corner of front of loom, and wind the warp around and around the loom until you have the correct number of strands for the project you wish to make. (B, Fig. 25.) Remember that it takes one more warp thread than you have beads in a row. Leave approximately as much space between warp threads as size of beads. When the warping is completed, fasten the end to the right hand corner of the front of the loom as shown in the illustration. The first row of beads will pull outside threads in a straight line with the warp threads.

To Block Design

Block out your design on graph paper, considering each square on the paper as a bead. (C, Fig. 25.)

If you do not have graph paper, mark off one-eighth inch squares on a piece of plain paper. Use crayons if you are going to use beads of different colours.

How to Weave

Take a thread about a yard long and tie one end to first warp thread on the right, and thread the other end through a long thin needle known as a bead needle. Follow the first row of squares on your graph paper and thread on as many beads as there are squares; with the colours in the exact order. Push them over the needle and down the thread against the warp to which the end is tied, and then bring the needle underneath all the warp threads and up on the left side. Put your hand underneath and force the beads up between, so that one bead is between each warp thread, and then put your needle back through the holes of the beads going from left to right, and pull the thread all the way through. You now have two threads through each bead, one underneath the warp and one on top. Continue weaving in this manner until your project is completed. (D, Fig. 25.)

When you have woven your strand as long as the top of the loom and you wish to make it longer, clip the ends of the warp at the corners and pull the weaving toward you, down around front of the loom. Cut all the threads to remove the strand when completed.

ORIENTAL KNOT

The oriental knot is one of the oldest techniques known in weaving but has been slow to be adapted to modern use. It could easily become one of the most popular because of the many ways in which it can be used and the fact that only one simple knot is used no matter how intricate the design.

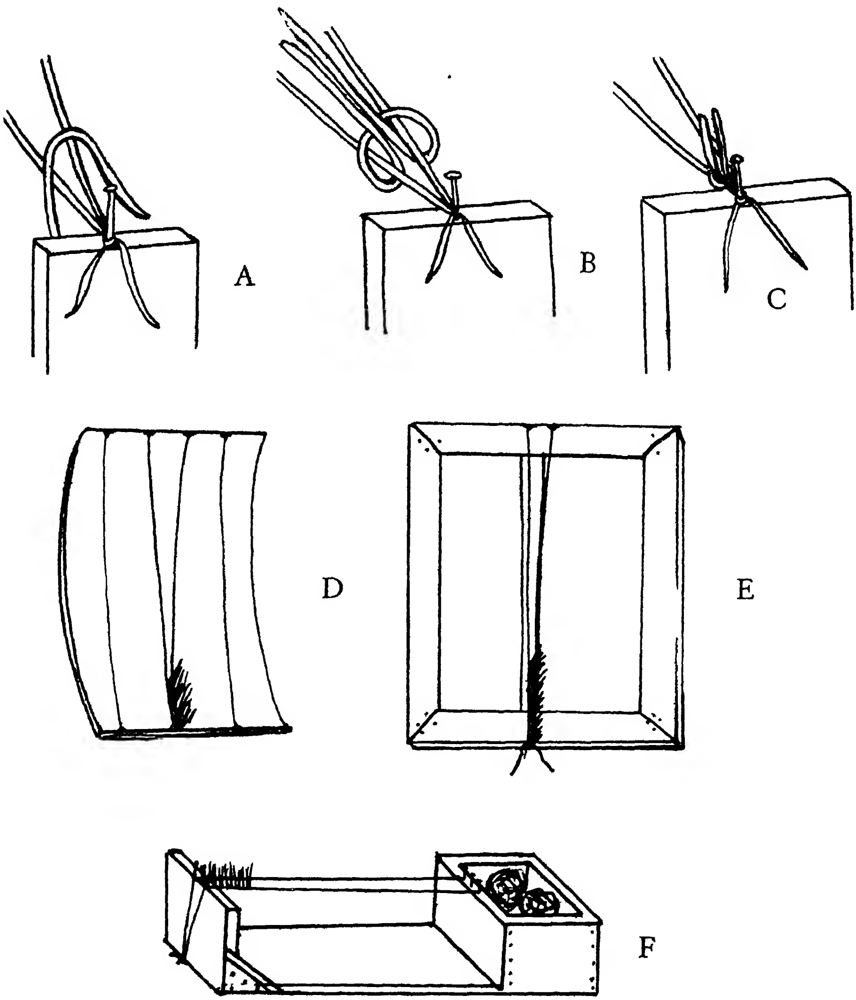


Fig. 26—Oriental Knot

To Tie Knot

Fig. 26 illustrates how the knot is tied around two warp threads. The string used for tying the knot may be single or double according to the thickness of the material used. It should be cut into pieces about three inches long and placed conveniently into piles, each pile containing a different colour. To tie the knot take a three inch piece of material and place it on top of the two warp threads with an equal amount extending on both sides. (A, Fig. 26.) Next put the two ends around and underneath the warp threads and draw them up between them so that they are between you and the loop formed by the middle of the string. (B, Fig. 26.) Pull the ends straight up and draw them toward you until they are tight and against the point of beginning of the previous knot. (C, Fig. 26.)

Single Oriental Knot

Several types of looms might be devised for the weaving of this knot but the two suggested here are the simplest to make and cost little or nothing for material. Fig. 26, D shows a loom made from heavy cardboard or illustration board. The advantage of this loom is that it can be made from material at hand, and the only tool needed is a sharp knife or a pair of scissors. It is also light in weight and is adaptable to varying age and ability groups.

To make this loom, cut the cardboard about fifteen inches long and six inches wide. Cut two notches about one-quarter inch deep at either end, about 1 inch from the sides as shown in the illustration. Now tie a piece of heavy cord around each side and draw it tight enough to make the loom curve slightly so that the fingers can reach under the centre warp threads to tie the knot. Find the centre of the top of the loom and make a mark three-quarter inch on either side and again cut notches about one-quarter inch deep. Cut another notch exactly in the centre at the bottom of the loom and you are ready to string on the two warp threads. The advantage of having the two notches at the top and one at the bottom is that the warp threads are held in a V shape thus making it easier to tie the knot.

Cut two pieces of warp long enough to go up the back in the two notches and down the front of the loom. Then tie them together at the bottom. As you weave, draw the two threads down so that the knots already tied will go up the back of the loom. It is not much of an advantage to make a longer string of knots than can be made on this size loom. As many short pieces can be made as desired and joined later when sewing them on to the material.

Fig. 26, E shows the same loom made from wood. Three-ply fir wood is suggested because it is easy to get and will not warp. At each end nail a strip of wood about one-half inch wide and three-quarter inch thick to hold the warp above the board. Cut two notches at the top about one and one-half inches apart as shown in the illustration and a single notch at the bottom. Use same directions for stringing and weaving on this loom as described in the cardboard loom.

ORIENTAL BOX LOOM (Fig. 26, F).

This loom is designed for the weaving of several knots in a row and into a long strip for trimming, belts, etc. The loom is made from three-ply fir, by cutting the bottom piece six inches wide and fifteen inches long. On one end is nailed a piece of wood 4″ × 6″ and at the other a small box is built to hold the extra warp.

MONK'S ROPE

Monk's rope is woven without a loom and it can be used in various ways, according to the thickness of the material used for the weaving. Heavy white butchers' cord makes excellent rope for yarn. Rags and jute can be used for handles for bags. Heavy silk cord or seine twine makes attractive belts. Coloured jute can be used for making jumping ropes, etc.

How to Weave

Measure off your cord or other material, allowing three and a half times the length desired in the finished work. Then find the centre of your strand and tie a slip knot.

To tie a slip knot, find the centre of your strand and double it. Grasp the doubled cord about five inches down from the top between thumb and forefinger of your right hand. With your left hand bring the loop thus made around your right forefinger, cross it over, and, while holding the four strands firmly between right thumb and forefinger, pull the loop under the farther strand which encircles your finger, take the cord from your finger, and you will have a knot. (Fig. 27, A.) By pulling the two long strands you will find that one is tight and the other when pulled will make the loop smaller. Keep this strand on the right side and place the loop on forefinger of right hand, holding the knot between thumb and third finger of same

hand as shown in (Fig. 27, B). Now grasp the immovable strand with the last three fingers of the left hand and with the forefinger go through the loop, keeping the finger parallel with forefinger of right hand, and reach down underneath the strand held by the three fingers and bring it up through the loop as shown in (Fig. 27, C). Remove forefinger of right hand from original loop and allow it to encircle forefinger of left hand.

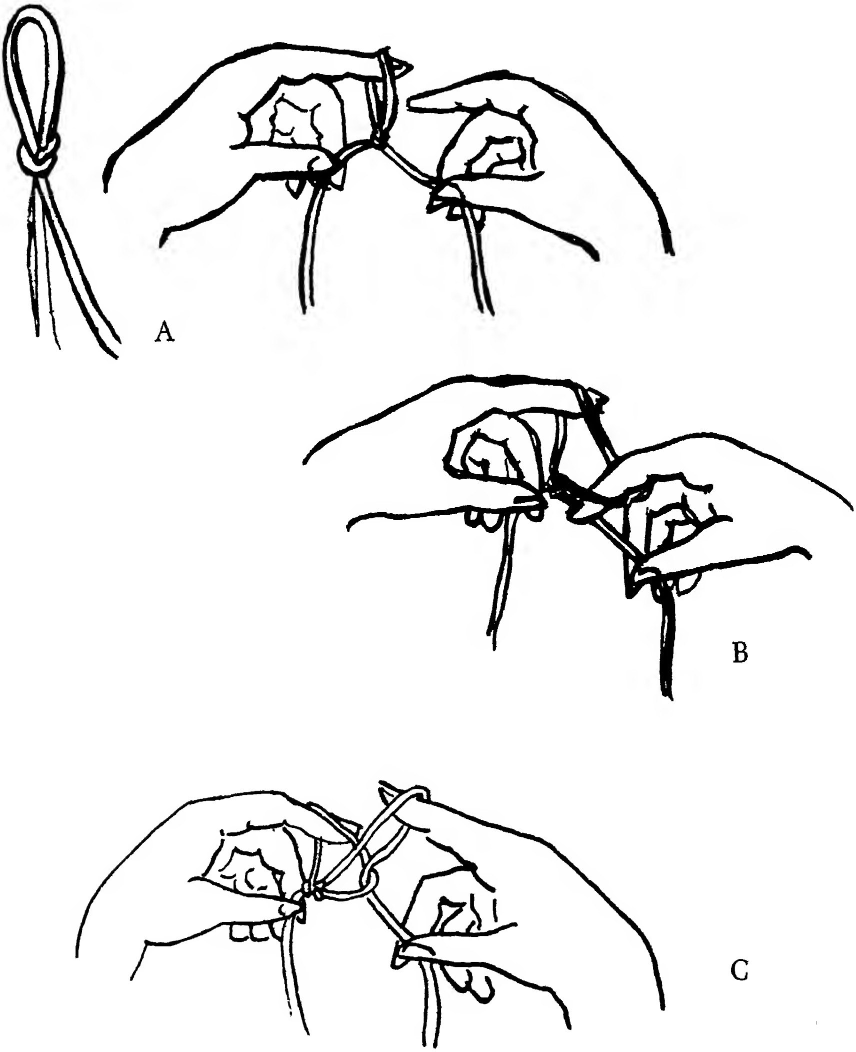


Fig. 27—Monk's Rope

Transfer hold from thumb and third finger on right hand to those on left and pull long strand on right until a knot is tied just above thumb and finger. (Fig. 28, D.) Now pick up this strand with last three fingers of right hand and pick it up with forefinger as you did with your left hand before. (Fig. 28, E.) Continue until rope is completed. (Fig. 28, F.)

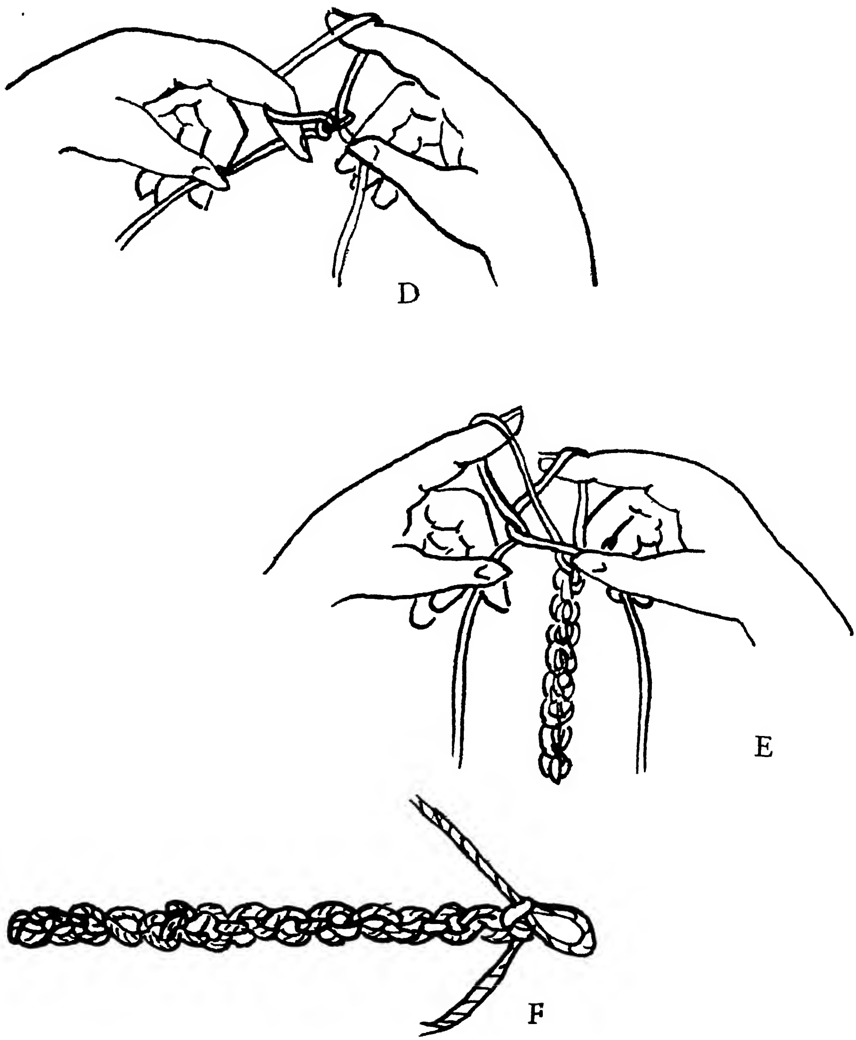


Fig. 28—Monk's Rope

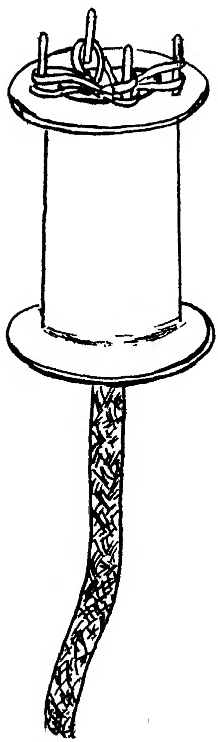
Variations

1. Use double strands for weaving, beginning with a slip knot as described before, only consider the double strands as one thread.

2. Tie several knots, then drop one loop and tie several knots using a single strand. Then drop that loop and pick up the one discarded before and tie the same number of knots as you tied before. All kinds of patterns can be worked out in this way, and the results are even more interesting if two colours are used.

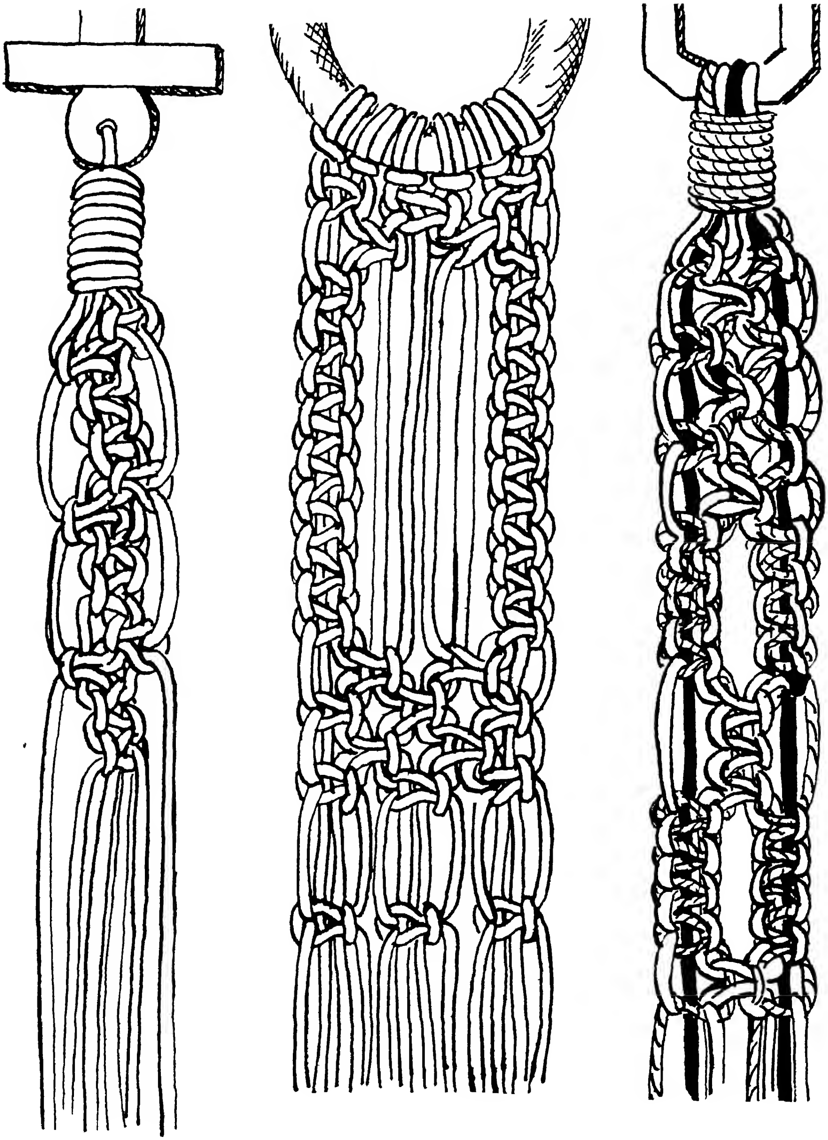
SPOOL WEAVING (Fig. 29).

Spool weaving, which produces the "horse-reins" of childhood, is described here because it represents a principle of weaving which is used in two large types of looms. These looms are used for what is called "rake knitting."



A spool, four nails, and yarn of some kind, are all you need to engage in spool weaving. Use large or small spools, according to the ply of your yarn. Ordinary string, cord, and woollen yarn are usually used by children for this work. On the larger spools, jersey or silk stockings can be used. Rug yarn is also suitable, and jute or very heavy cord makes good jumping ropes.

Drive four nails or brads about halfway into the top of an empty spool. Space them evenly, and drive them in as near the whole as possible. Begin by putting the end of your yarn through the hole in the spool, letting it come out at the bottom end. Now, at the top, carry the yarn around one nail, then diagonally across the hole to the second nail and back. Your yarn will now be outside the first nail. Carry it, on the outside, to the next nail, and make another diagonal. There is but one operation. Holding the yarn firmly around the outside of the nails, with a hairpin or crochet hook, lift the yarn which is hooked over the brads, from the outside to the inside and let it go. Continue round and round, and soon a rope-like piece of weaving will emerge from the bottom of the spool.



6-strands 12-strands 8-strands

Fig. 30—Examples of Square Knotting

Each strand must be three times as long as finished measurement for pattern weaving, and three and a half times as long for solid weaving. Six, eight, ten, or twelve strands can be used.

KNOTTING AND BRAIDING

The examples of knotting and braiding which follow are elaborations of one knot or one braid. It is useful to know how to make these various types of knots. Belts, trimmings, tie-backs, and many other things can be made entirely by hand in this way. You have only to anchor your work on a hook or nail, or by closing a table drawer on the ends of the strands, and you are ready to work. Materials used are hard seine twine, Belfast cord, jute, candlewicking, string, leather thongs, and—for very fine work—silk cording.

Cords can be attached to a buckle, if you are making a belt, or else fastened together with string, before starting to work. (Fig. 30.) Fig. 31 shows the detail of tying a square knot. Four strands are always included in the operation of tying a square knot. In the diagrams, A and B illustrate how the cord is attached, in preparation for knotting. C, D, and E show the three operations required to tie the knot. F shows how two knots are joined together.

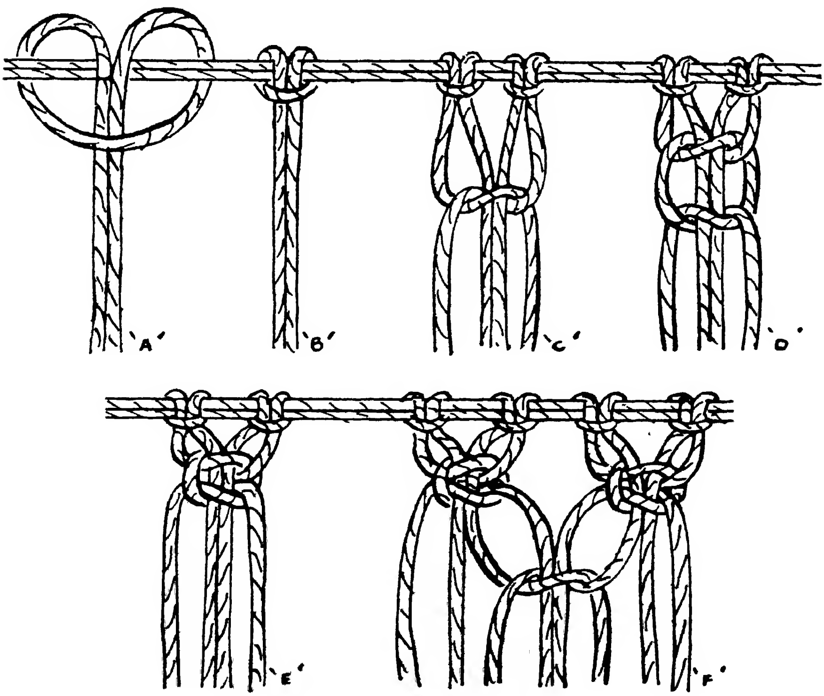
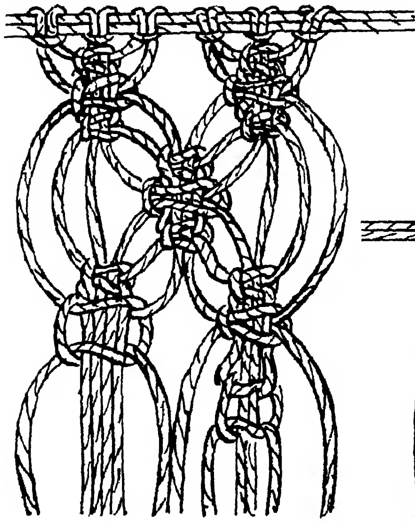
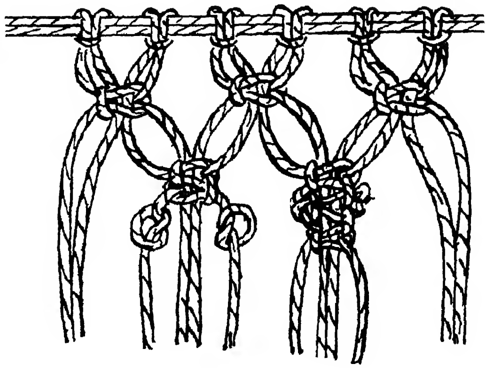


Fig. 31—Tying a Square Knot

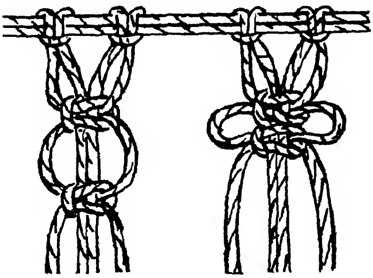
Fig. 32 illustrates how patterns may be worked out by tying knots in different series. After one learns to tie a knot it is no problem to make up an original design.



Large Collecting Knot



Knotted Picot



Single Picot

Fig. 32—Knot Patterns

Picots are made by tying the first knot in place and then tying another about one-quarter or one-half inch below and then slipping the second knot up over the two middle strings tight against the knot at the top. The loops on either side form the picot.

TO TIE A SQUARE KNOT IN ONE OPERATION

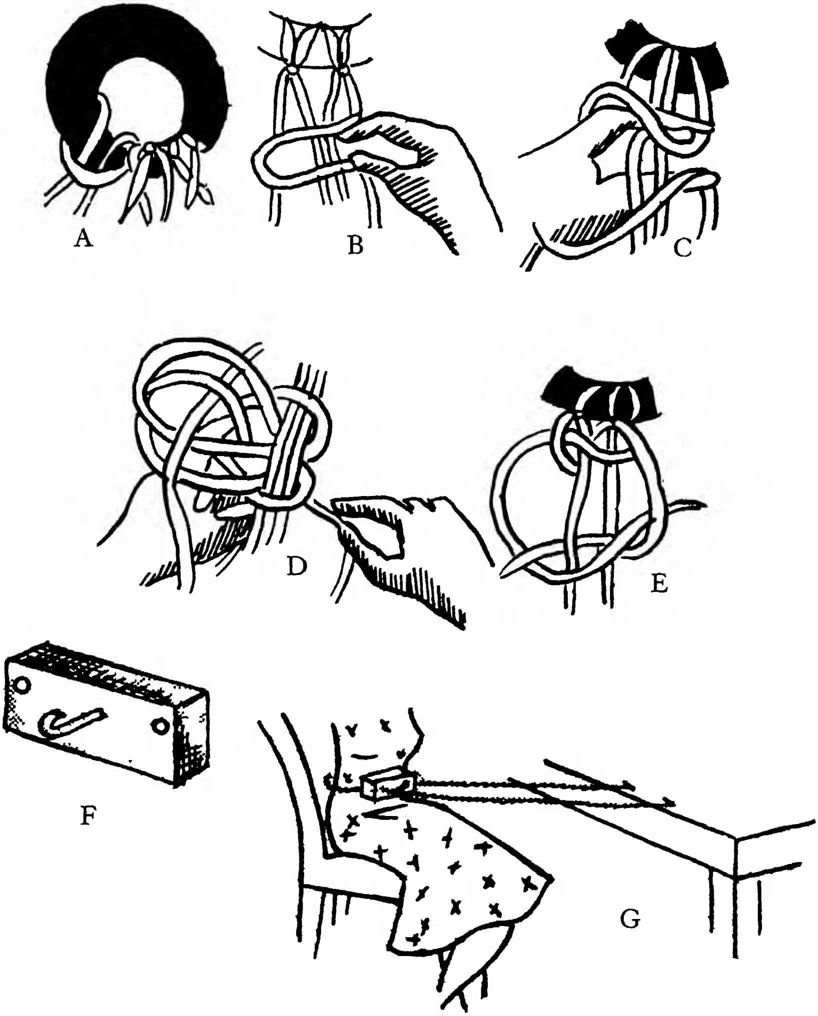


Fig. 33—To Tie a Square Knot in One Operation

Square knots are always tied in groups of four strands. (A, Fig. 33.) To tie the knot, separate the first four strands on the left from the others, and hold the middle two taut, ready for the tying of the knot. A hook attached to a block of wood and tied around the waist is the best method. (Fig. 33 F and G.)

Now take the fourth strand, or the one on the right, and make a loop about two inches long and about six inches below the ring. (B, Fig. 33.) Place it on top of the two middle strands that are being held taut, holding the end of the loop with the right hand. (C and D, Fig. 33.) Put the thumb and first finger of the left hand down through the top of the loop that extends over the two middle strands, and reach down and under the middle strands and catch the end of the loop where the fingers are holding it, pulling it through until it is tight. (E, Fig. 33.)

Now take the first strand, or the one on the left, and pull it all the way through the double loops. You are now ready to separate the two knots. Reach under the two loops with the left hand and take hold of the small loop underneath, and hold the long string on the right with the right hand, and pull back and forth until the knot is separated. Now take the strings below the first part of the knot and pull the first half of the knot up tight against the top. Then pull the strings below the second part of the knot until it is pulled up tight against the first half of the knot.

TO MAKE A PATTERN

After you have tied the first knot as instructed above, take the second group of four and repeat in the same manner. To form the second part of the pattern, take the fourth and fifth strands for the taut strings and tie a knot with the third and sixth strands. Repeat so that you have two knots on the middle strands. Now begin with the first four strands, again tying a square knot by only pulling it up even with the last knot in the middle row. Again tie two knots on each, then two in the centre, and repeat until the belt is finished. The graph (Fig. 34) illustrates how you may design your own pattern. Patterns may be worked out on graph paper, with each square representing two squares.

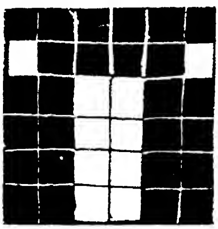


Fig. 34

TO MEASURE CORD

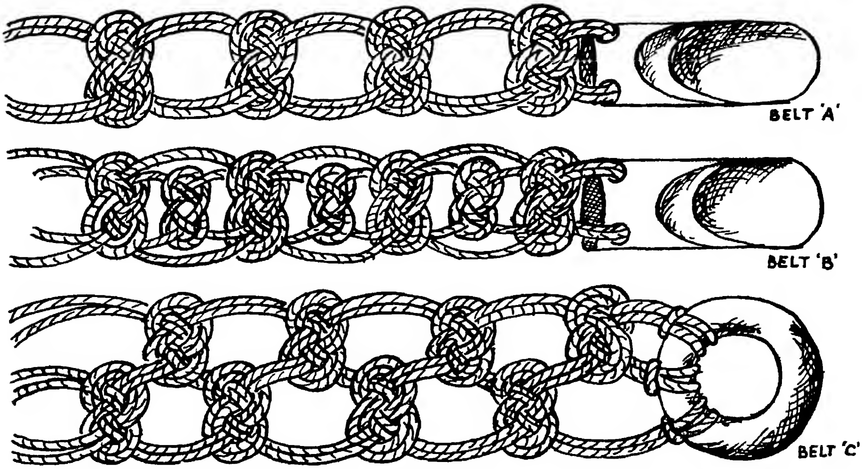


Fig. 35—Carrick Bend Knot Belts

Belt A—Each strand is three times the length of the finished measurement.

Belt B—Cut two outside strands three times waist measurement and the inside strands half again as long. The extra length is taken up with the small knot in the centre.

Belt C—Measure four strands three times waist measurement and two strands four and one-half times waist measurement. (Fig. 35.)

TO TIE KNOT

Lay the belt on a table and straighten out the strands so that there are two on each side. Take the two on the left hand side and form an "O" or round loop, being careful the long part of the strand is on top of the loop. Lay the "O" over the other two strands. (A, Fig. 36.)

Now take the two strands on the right and weave them over the other two long strands just below the loop; under the left of loop up through loop and then under the part that formed left side of the loop; under the two strands on the right and up through right side of the loop, and then knot is completed. (B and C, Fig. 36.) Straighten out the strands that have become twisted and work the knot up toward the top to its proper place. Pull it just tight enough to allow the knot to remain flat. (D, Fig. 36.)

Belt A (4 Strands)—The knots may be placed one to one and one-half

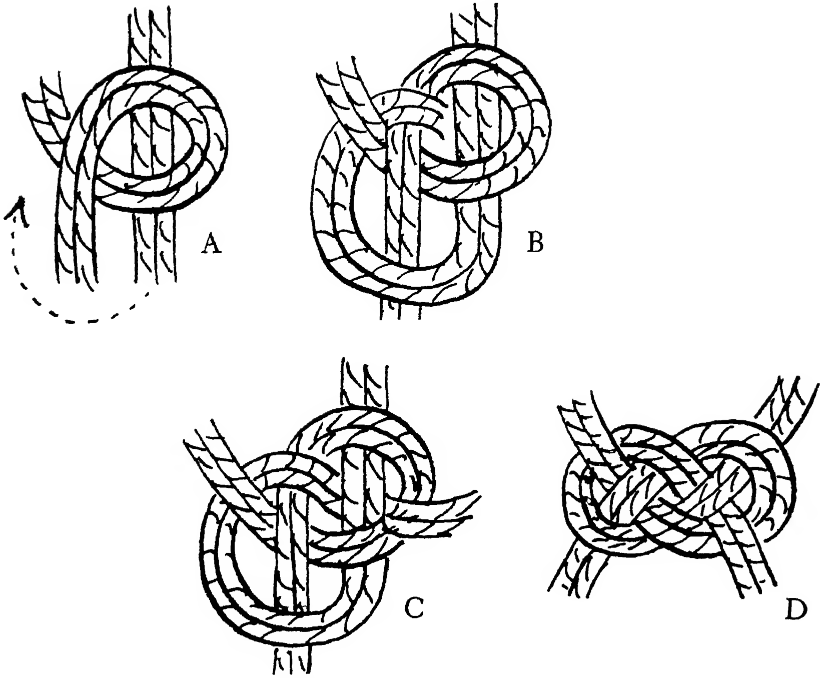


Fig. 36—Tying Knot

inches apart in equal space around the belt, or they may be grouped in series of two or three knots close together with an inch or more of space. (Fig. 33.)

Belt B (4 Strands)—Alternate knots (one including all four strands, and the other containing only the two inner strands). This belt contains six strands. The two middle strands are one and one-half times longer than the two strands on either side. (Fig. 33.)

Belt C (6 Strands)—First tie the knot with the first four strands on the left and then tie knot with the four strands on the right. The two middle strands are included in both knots. (Fig. 33.)

FIVE BRAID BELT (Fig. 37).
To Measure Cord

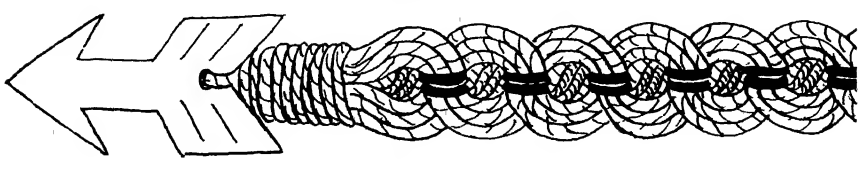


Fig. 37—Five Braid Belt

Waist measurement plus six inches is the length of one strand. Assuming three colours are to be used, there will be:

Six strands of Colour A
Four strands of Colour B
Two strands of Colour C

Measure six strands of colour A without cutting the loops. Measure the four strands and the two strands in the same way. At the end of the sixth strand of colour A, or the fourth strand of colour B, or the second strand of colour C, add fourteen inches, which will be used if you attach a buckle.

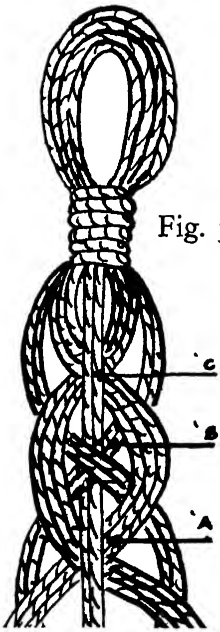


Fig. 38

To Braid (Fig. 38).

Let's pretend that the belt is to be made in three colours, A, B & C. There are six A strands, four B strands and two C strands. Separate them so there are three A & two B on each side of the two C strands. Take the three A strands on left and pass them to right under C. Next pass A strands on right to left under C and other A strands. Now take two B strands on right and bring down under A and over C to left. Next take the two B strands on left down under A, over C and other B strands to right. Flatten out all the strands so that they make a flat braid. Repeat until belt is completed. (See general directions for instructions on attaching the buckle.)

SWEDISH BIAS WEAVE BELT (Fig. 39).
To Measure Cord

A—This belt may contain ten, twelve or fourteen strands. Each strand should be finished measurement plus eight inches, excepting one strand which should be fourteen inches longer than the others. This last strand is to be used for attaching the buckle after the belt is completed.

B—Allow three inches longer than finished measurement if you are using a buckle. Use eight to sixteen strands, according to width you desire. Each strand should be eight inches longer than the completed work. Cut a small piece ten inches long to tie loops together at one end.

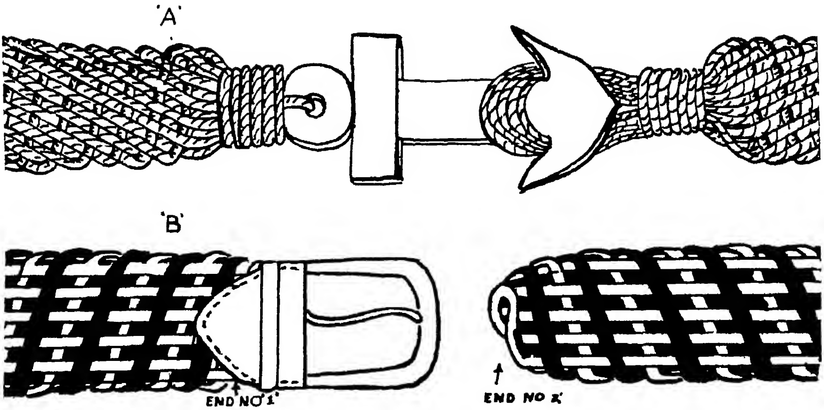


Fig. 39

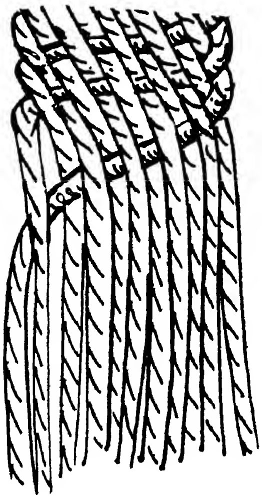


Fig. 40—Swedish Bias Weave Belt

To Weave

A—(Follow Fig. 40) Take the outside string on the right side and put it over the next string, under the next, over the next, etc., going over and under from left to right until you reach the other side. Hold the string in the left hand, go back to the right side, take the right outside string, weave it over the next, and under the next and so on. The rule is always right-hand string over the next string, under the next and so on across, continuing until the belt is finished. At the end of each row the cord just woven across previously is brought down and incorporated in the weaving, pushing the weaving cord up toward the loops so that each diagonal cord is equally distant from its neighbors. Pull it through firmly always keeping the belt the same width.

B—Begin weaving on End No. 2. (See Belt B in Fig. 39.) Tie all the loops together with a small piece of cord (A, Fig. 41) and then attach to a nail driven in a wall about as high as your shoulder, or on the edge of a camp table, to make it convenient for weaving. Flatten out the strands and hold them in place with your left hand.

Now take the first strand on the right and weave it over the second, under the third, over the fourth and so on until the strand is on the left side of the

belt. The second row is woven the same way by taking the first strand on the right and weaving it over and under all the way across, and then including the first strand brought across in the weave by bringing it down over the second strand. Continue weaving until you have the desired length.

To Attach Buckle

Cut a piece of scrap leather or heavy leather as shown in (Fig. 41, B). Punch holes so that it may be easily sewed and insert buckle. Fold the two ends and insert belt. Cover cord under the leather with Duco cement and allow to dry. Stitch around edge with heavy thread. (Fig. 41, C.)

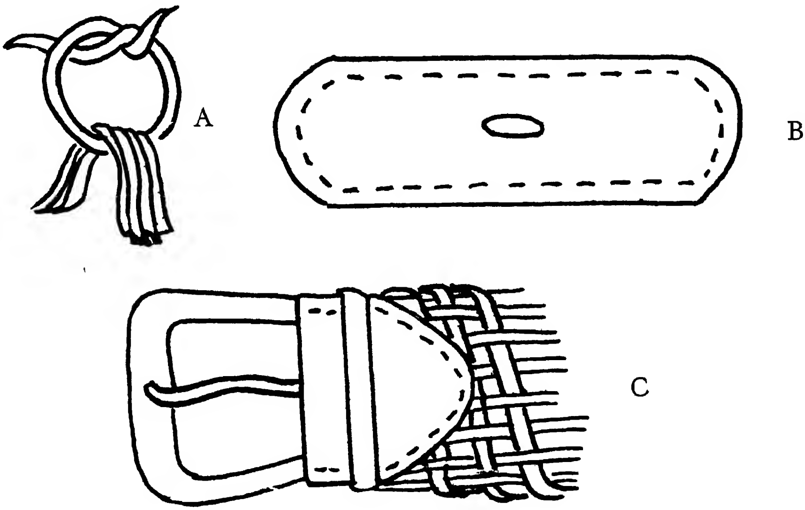


Fig. 41—Attaching Buckle

BRAIDED BELTS (Fig. 42)

To Measure Cord

Belt A—Since there is an uneven number of strands in this belt (nine strands), it is impossible to have loops at both ends. Therefore, a long strand is left at both ends, one for whipping loops to fasten over the buckle and the other for attaching the buckle when completed. Seven of the strands are waist measurement plus six inches, and the first and last strands are fourteen inches longer. Cut a small piece of cord six inches in length to be used in whipping.

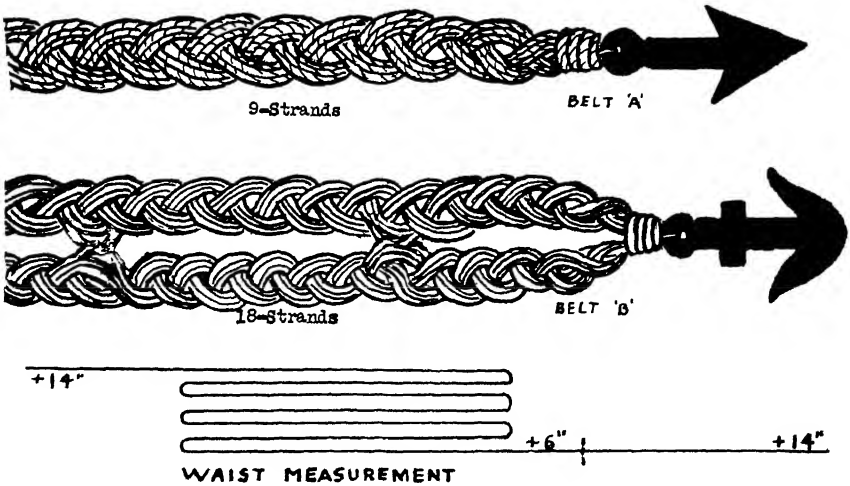


Fig. 42

See General Directions for Instructions on Whipping Ends

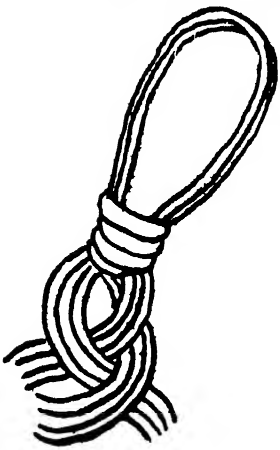


Fig. 43

To Braid

Separate the nine strands into three groups (three strands to a group) and plait into a flat braid until you have sufficient for the belt, taking into consideration the buckle which constitutes part of the total length of the belt. (Fig. 43).

To Finish

When the proper length is reached, tie the ends together with thin string and cut away all excepting the long strand for attaching the buckle. Draw the remaining strand through the buckle and whip.

To Make a Wider Belt

Belt B—A wider belt can be made by combining two plaited braids. The measurement of the cord is the same except that one fourteen-inch strand is added at the end of the eighteenth strand, instead of one after each nine

strands. Whip the loops as instructed. Work about seven plaits with nine strands and then seven plaits with the other nine strands, and then link them together by overlapping one strand from each plait. Continue this way until the belt is completed. Add the buckle as instructed.

GENERAL DIRECTIONS

To Whip

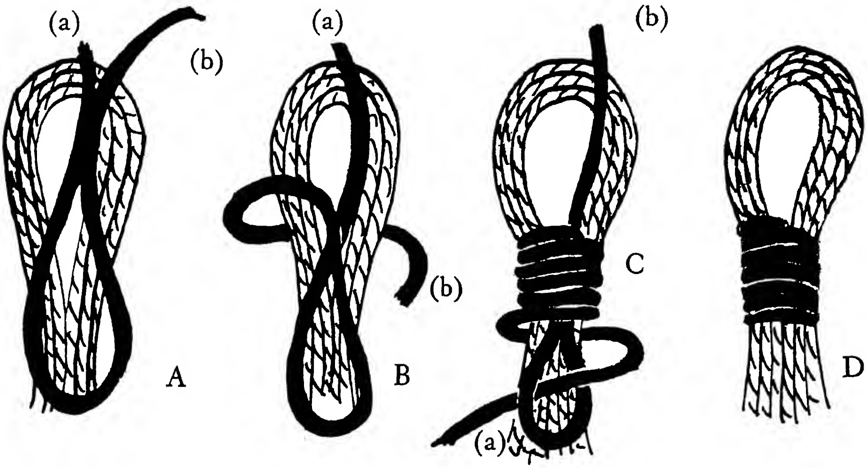


Fig. 44—Whipping

Cut a piece of cord fourteen inches in length and make a loop at one end so that there are three inches on one side (Fig. 42, A-(a) and eleven inches on the other side. (Fig. 44, A-(b.) Hold the belt in the left hand with the loop about four inches above the fingers and lay loop of extra piece on top with loop in opposite direction from those of belt. (Fig. 44, B-(a) and (b). Then take the eleven-inch strand in the right hand and begin winding around the belt as tightly as possible. Continue until you have an inch or more of whipping and then thread the end of the strand through the loop. (Fig. 44, C-(a) and (b). Pull up on (a) until (b) is drawn half way to the top. Cut both ends close to whipping. (Fig. 44, D.)

To Tie Belt

Cut a leather thong ten inches long and about one-half inch wide at one end and tapering to one-quarter inch at the other. Cut a slit in the half-

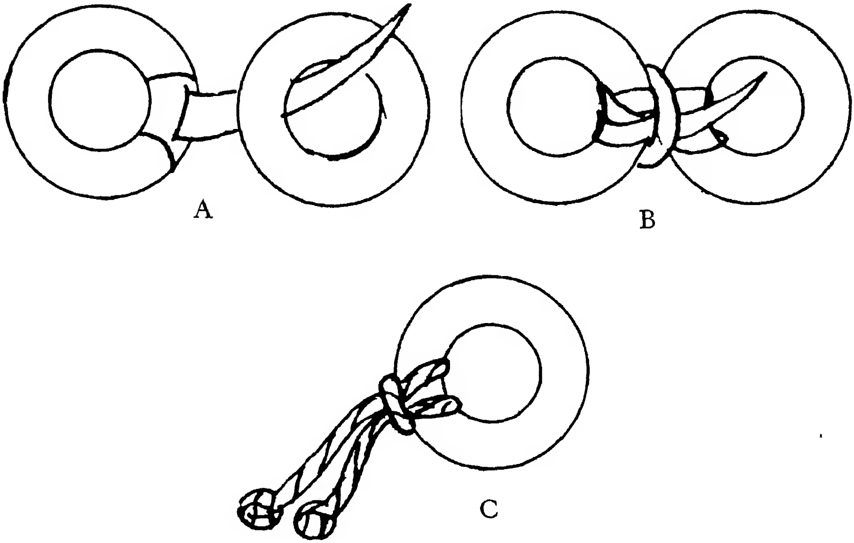


Fig. 45—Tying Belt

inch end, pull it through one ring and draw the whole strand through, thus attaching it to the ring. To tie, place the two rings together and pull the thong under the ring to which it is not attached, then up through it, over both and down through the first ring. Again bring it under both and up through second ring, over the top of both rings and down through first ring again. You now have the two loops around the rings. Bring the thong up between the rings and over the double loops from top to bottom, and under the first ring again. Now bring it up through the first ring and over the top and under the loop just made between the buckles. (Fig. 45, B.) Cord may be used instead of a leather thong. Attach as shown in Fig. 45, C.

To Whip End and Attach Buckle

When you have determined the exact length of the belt, not forgetting the buckle is included, tie a piece of soft string or a piece of unravelled cord around the belt at the end of the weaving. Wrap it around tightly several times and tie a firm knot, being very careful not to cut the long fourteen-inch piece. Shape the ends with the scissors, rounding the loose ends.

Now slip the buckle on the long string, drawing the buckle down very firmly against the cut ends of the weaving. It should fit snugly. (Fig. 46, A). Now lay another six-inch piece in a loop (Fig. 46, B), but this time the

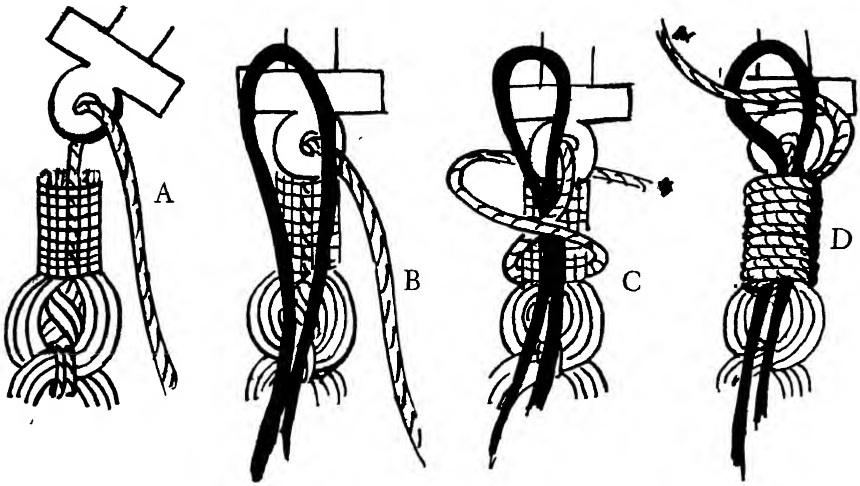
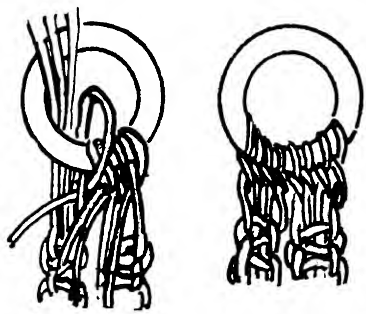


Fig. 46—Whipping End and Attaching Buckle

loop of this small piece is toward, not away, from the nearest belt end. Draw the long piece on which the buckle is strung along the belt about an inch from the buckle. (Fig. 46, C.) Start wrapping it very tightly around the weaving, winding toward the buckle and up to it, leaving no gap between the buckle and the belt. Thread the end of the short loop until the whipping end is down under the wrapping and half way through. (Fig. 46, D.) Cut off all loose ends closely and your belt is ready to wear.



BACK FRONT

Fig. 47

To Attach Round Buckle (Fig. 47).

Take the ends that have been left over from the knotting and, with the back of the buckle facing you, run them through the centre of the ring, and down toward the back of the belt. Take one strand at a time and thread from back to front immediately below the buckle, around the original strand and back again. When all strands are treated in this manner, divide into groups of four and tie a square knot with each group. Cut all ends off even with knots and cover with Duco cement to keep them from ravelling.

Leathercraft

SELECTING THE LEATHER

IN PLANNING to make an article of leather, it is of the utmost importance that you know how to select the proper hide for your project. Even the best craftsman would have difficulty in producing a fine piece of leather work from the wrong type of skin. Therefore, when buying leather, the following points should be borne in mind:

Unless tooling leather has been tanned dark, it cannot be dampened without spotting.

Small skins, coming from young animals, are best, because they are of a finer quality and less apt to be marked with cuts and scratches.

Tooling calf skin has good colour and is very pliant. It is also adaptable to stains and paints.

Russian tooling steer hide is heavier than calf skin and has about the same qualities as the calf skin.

Goat skin is usually tanned by the sumac process. It is known as morocco leather and takes dyes and paints beautifully.

Sheep skin is a toolable and inexpensive leather, excellent for beginners.

Suède is lamb skin that has been tanned and shaved, leaving an undressed surface. It is excellent for colour and stencil work, appliqué and inlay.

Pig skin has too tight a texture for tooling. However, it is a strong and durable leather and can be used for heavy projects.

TYPES OF LEATHERS

Tooling Leather:—Tooling leather is firm and yet soft enough to absorb water and retain a crease or design motif indefinitely. The following are some of the better known tooling leathers: Tooling cow hide, goat skin, steer hide, sheep skin, Russian tooling calf skin.

Non-Tooling Leathers:—Non-tooling leathers have a firm surface which will not retain a crease or a design. Most non-tooling leathers are practically waterproof. Some of the better known non-tooling leathers are: suède, pig skin, kid skin, alligator, Morocco.

LACINGS

Goat skin, raw hide, calf skin, pyro.

SKINS

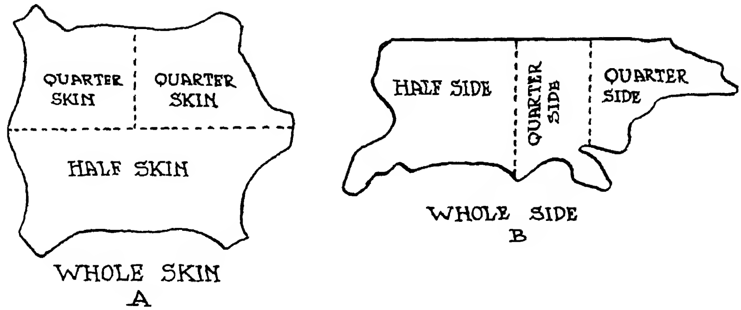


Fig. 1

Whole skins are bought in their natural or regular shape. A half skin is one that has been cut down the centre from neck to butt. (Fig. 1-A.)

A quarter skin is a half skin cut in the centre from the backbone to the belly. (Fig. 1-A.)

A side is considered a whole skin and is sold as a whole side, half side or quarter side. (Fig. 1-B.)

See Fig. 2 for surface characteristics of leather.

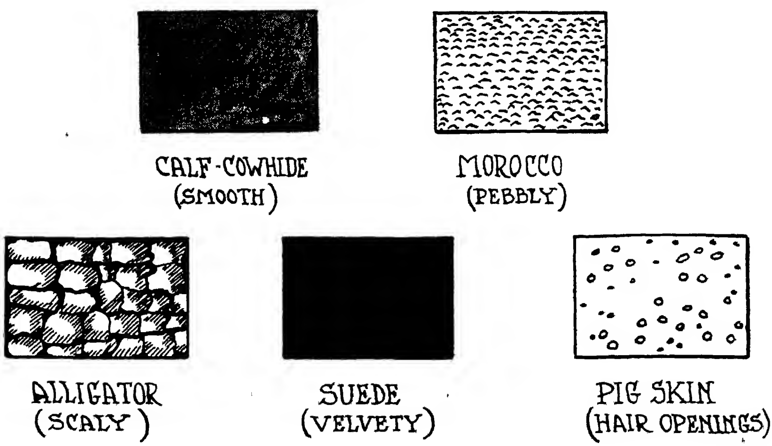


Fig. 2—Surface Characteristics of Leather

TOOLS AND WORKING EQUIPMENT (Fig. 3).

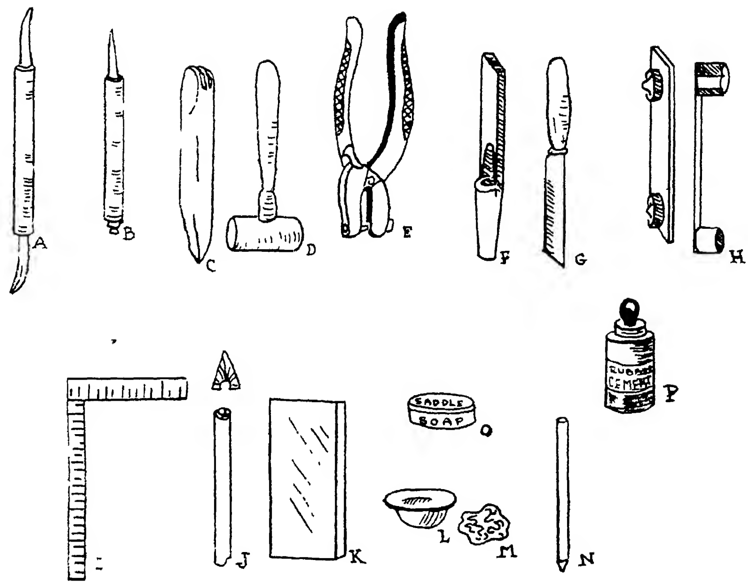


Fig. 3—Tools and Working Equipment

A. Spoon modeller	F. Drive punch	K Scrap glass or marble
B. Tracer or scriber	G. Skiving knife	L. Water pan
C. Wooden edge creaser	H. Snap button fastener	M. Sponge
D. Wooden mallet	I Steel square	N. Eyelet setter
E Spring punch	J Background stamp	O. Saddle soap
		P. Rubber cement

SOME FACTS ABOUT WORKING WITH LEATHER

When tooling, always keep the leather moist. Leather should be cut with a sharp skiving knife to obtain clean tool edges, and never with a scissors. To clean soiled leathers, moisten and apply saddle soap to the soiled surface and work up into a rich lather. Then wash off the saddle soap with a sponge and clean water. A protective coat of saddle soap will guard the leather against surface stains. Leather oil tends to keep leathers pliable.

DIRECTIONS FOR SETTING A SNAP BUTTON

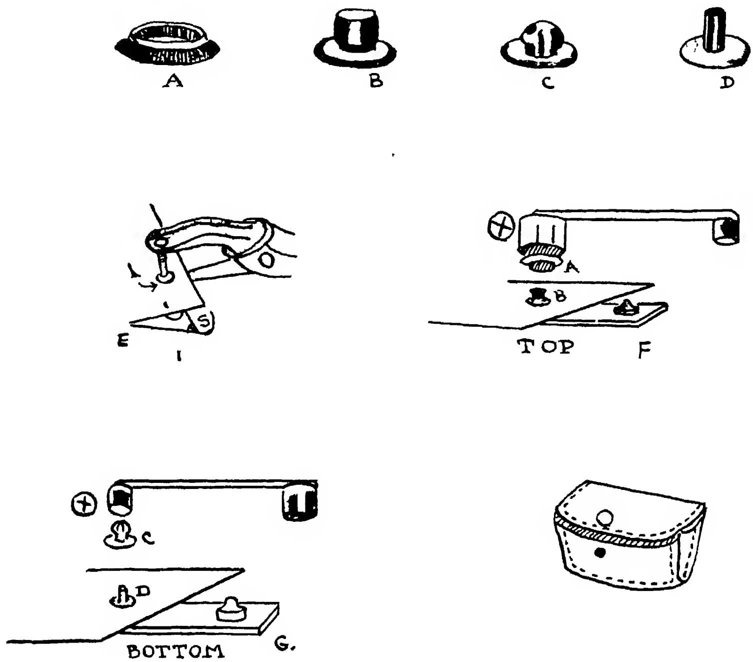


Fig. 4—Setting a Snap Button

The four parts of a snap button are (A) the cap, (B) the eyelet, (C) the spring, and (D) the post. (Fig. 4.)

Punch a large hole through the flap (the upper part of the project for (A) the eyelet, and (B) the cap. (Fig. 4.)

Punch a small hole through the under section which is to receive (C) the spring and (D) the post. (Fig. 4-E.)

Slip the steel rule of the snap fastener under the leather, with the LARGER of the two points coming out through the large punched hole.

Place the eyelet directly over the point and over this set the cap.

Place the large protective end of the snap fastener over both pieces and strike with a wooden mallet to secure in place. (Fig. 4-F.)

Repeat this procedure, using the smaller pieces of the snap fastener and snap button. (Fig. 4-G.)

SETTING AN EYELET

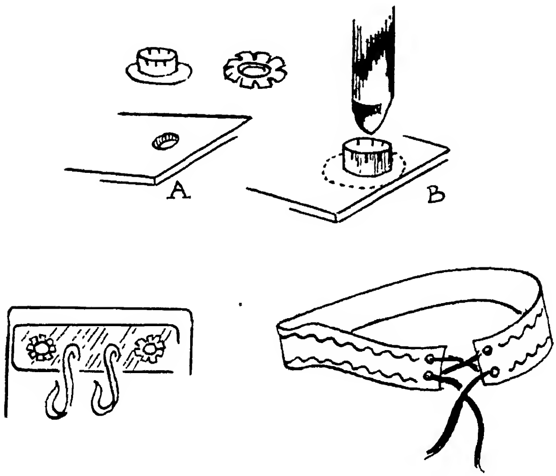


Fig. 5—Setting an Eyelet

Punch a medium sized hole through the leather. (Fig. 5-A.) Insert the eyelet through the opening. Place the eyelet directly in the centre of the hole and pound gently with a wooden mallet. (Fig. 5-B.)

SKIVING

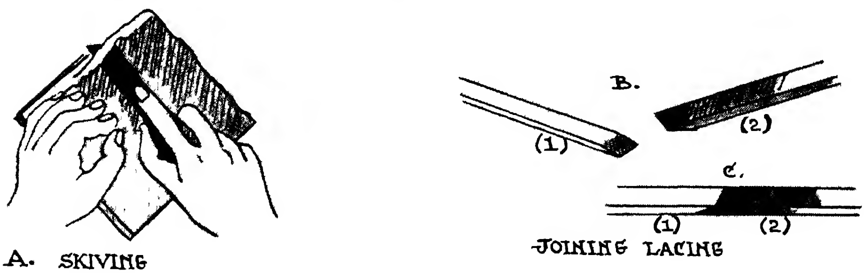


Fig. 6—Skiving and Joining Lacing

When more than one piece of leather is going to be used, as in a wallet or purse, the fleshy sides of the leather are tapered down at the edges (skived) to reduce the thickness. (Fig. 6-A.) Skive off layers of the fleshy surface until the desired thinness is reached.

JOINING LACING

To join two pieces of lacing, skive the upper side of one end (Fig. 6-B (1), and then skive the under side of the second end piece. (Fig. 6-B(2.) Apply rubber cement to both skived surfaces and allow them to dry thoroughly. Then overlap the skived edges and press firmly in place. (Fig. 6-C.) When pieced in this manner, the joining will not be visible. (Fig. 6-C (1) and (2.)

WAYS OF DECORATING LEATHER

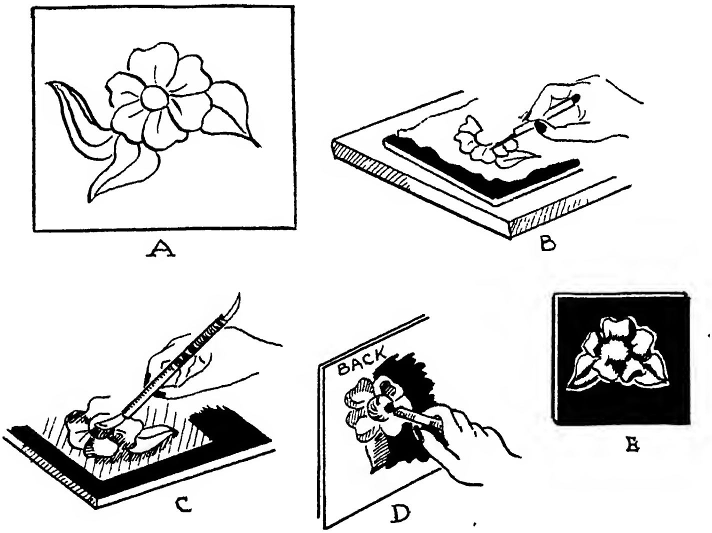


Fig. 7—Tooling—Modeling—Embossing

Tooling, modelling, and embossing are ways of decorating leather.

Draw the pattern and design on tracing paper. (Fig. 7-A.)

Cut the leather to size with a skiving knife, using a steel square to get a clean sharp edge.

Moisten the leather only enough to make it pliable. Use a damp sponge and rub over the fleshy side of the leather, taking care not to allow the moisture to ooze through the right side of the leather when the tool is applied.

Place the tracing paper pattern on the surface of the right side of the leather. Place both the leather and the paper on glass or a marble slab.

Trace over the lines of the pattern with a scriber (tracer), bearing down to obtain a clear impression. (Fig. 7-B.)

Remove the paper and then tool (or retrace) the outline with the small end of the modeller until a bold impression is obtained. This is called tooling.

For flat modelling, use the spoon (broad) end of the modeller, pressing down on the leather close to the design outline. (Fig. 7-C.)

In repoussé or embossing (relief modelling), place the leather with the finished surface face down, and press the parts that are to be raised with the ball end of the scribing tool. (Fig. 7-D.) After all the required parts have been sufficiently raised, turn the leather over right side up and repeat the tooling procedure to deepen the outline, until the desired degrees of depression and elevation are reached. (Fig. 7-E.)

WAYS OF COLOURING LEATHER

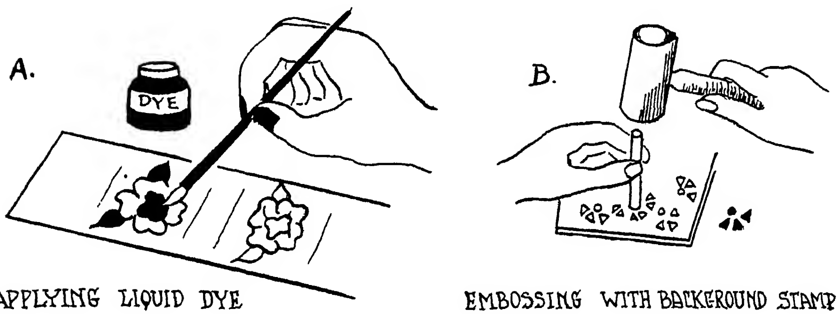


Fig. 8—Colouring Leather

Leather can be coloured with paints, dyes, and enamels.

Natural or light shades of calf skin and cow hide take colours most effectively.

The design to be coloured is first tooled on the leather.

Moisten the surface of the leather slightly before applying the colour.

Apply the paints or liquid dye with a camel's hair brush, permitting each application to dry thoroughly before a second application. (Fig. 8-A.) Before applying directly to the project, always test the colour on a piece of scrap leather.

In covering large areas with colour, a wad of cheesecloth or a sponge used in a rotary motion is most effective for obtaining unstreaked surfaces.

Allow the colours to dry and then polish with saddle soap, using a soft cloth for this application.

The design may be modelled or embossed before or after the colour has been applied. (Fig. 8-B.)

APPLIQUÉ

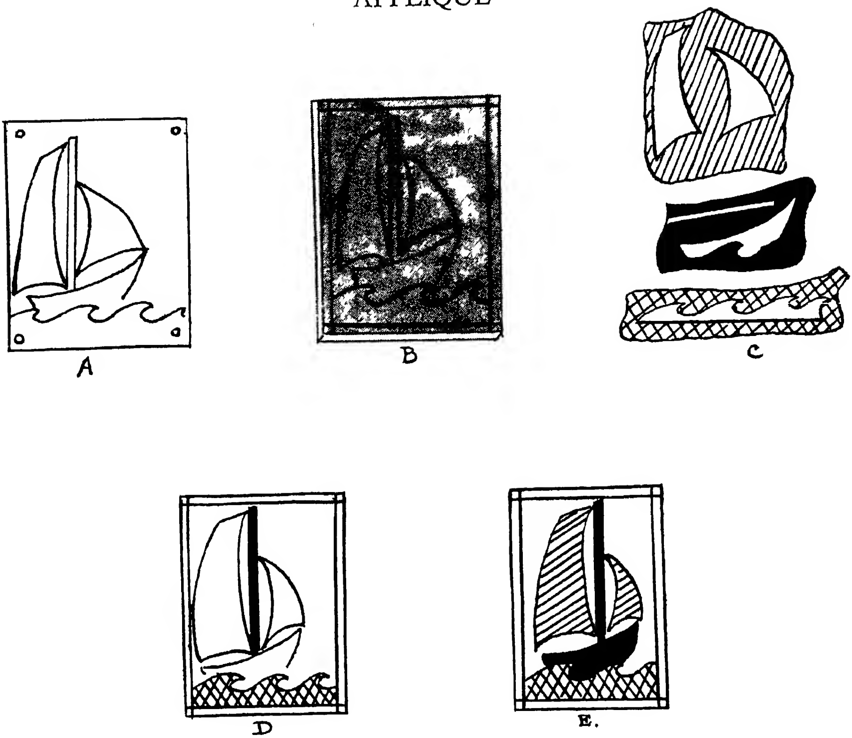


Fig. 9—Appliqué

Draw the pattern and design on tracing paper. (Fig. 9-A.)

Follow the steps given in the working procedure for tooling leather, which will be found in this chapter in the section on Ways of Decorating Leather. (Fig. 9-C.)

Remove the paper patterns from the pieces of leather and rub off surplus cement.

Apply rubber cement over the surface of the tooled design in the areas which are to receive the coloured leathers. Allow the cement to dry thoroughly.

When the cement has lost its gloss, carefully mount the coloured leathers on the tooled design, pressing each piece firmly in place. (Fig. 9-D and E.) Rub off excess cement with the finger tips.

CARVING LEATHER

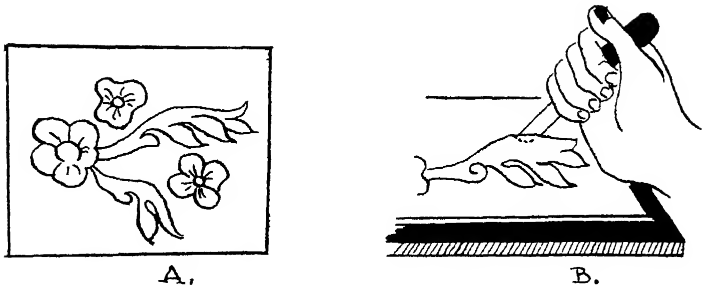


Fig. 10

Carved decorations are appropriate for use on cow hide, steer hide and other heavier leathers.

The design is traced on the leather by the tooling process.

The outline is scored or cut approximately 1/4″ on heavier leathers, and not more than 1/32″ of the thickness of the lighter weight leathers. (Fig 10-A.)

The scoring may be done with a knife as shown in Fig. 10-B. Place the leather on a firm wooden surface before incising.

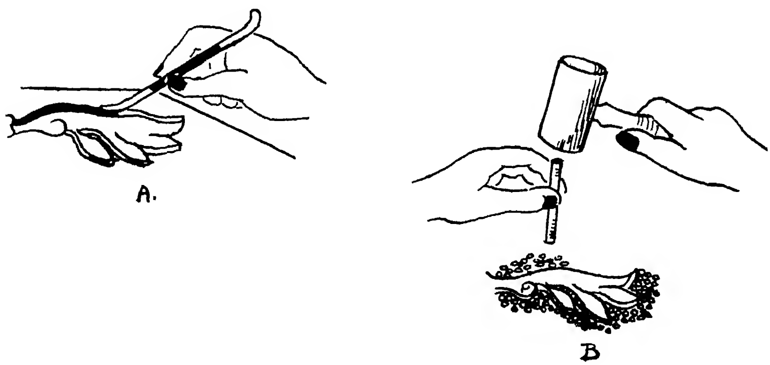


Fig. 11—Carving Leather

Using the tooling end of the modeller, spread apart the incised outline. (Fig. 11.)

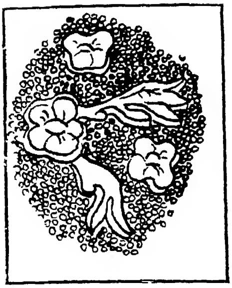


Fig. 12

Using a background stamp and mallet, hammer down all portions of the design which are not to appear elevated. (Fig. 11-B.)

After the carved design is completed, leather oil or dyes may be used to darken the background areas. This will produce a pleasing contrast of light and dark colouring. (Fig. 12.)

When the leather is thoroughly dry, wax with saddle soap and polish with a soft cloth.

LACINGS

Whipped Edge Layover Stitch

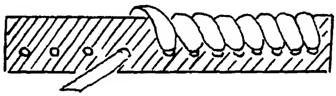


Fig. 13

Punch holes with a tube punch ⅛″ from the edge, spacing the holes according to how far apart the lacing stitches are to be. The length of the piece of lacing should be approximately two and one-half times the length of the edge to be laced. The lacing is passed through the punched holes and over the edge, as shown in Fig. 13.

Cross Stitch

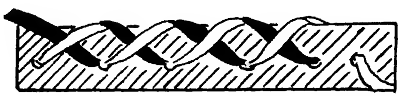


Fig. 14

The holes are punched as in the instructions above for the whipped stitch.

Start lacing through the holes from the left, skipping every other hole. Then, using a contrasting coloured lacing, start lacing from *right to left,* passing the lacing through the holes previously skipped. (Fig. 14.)

Saddle Stitch

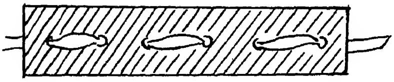


Fig. 15

Lace the thonging in and out of the holes in running stitch fashion. This form of lacing is excellent for the simple joining of two pieces of leather. (Fig. 15.)

Double Layover Stitch

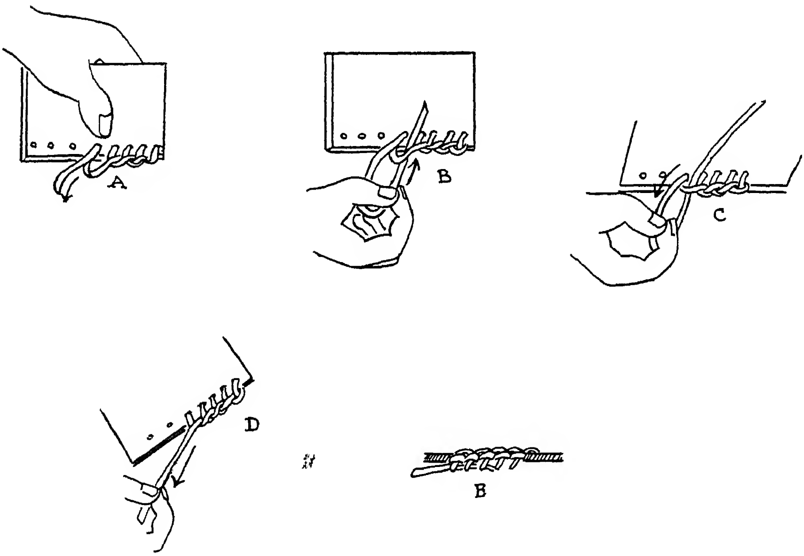


Fig. 16—Lacing

Bring the thonging up through from the underside of the leather. (Fig. 16-A.) Allow the thonging to remain slack, thereby forming a loop.

Pass the end of the thonging up and through the loop, and tighten up on the slack. (Fig. 16-B.)

Pull the loop toward you. (Fig. 16-C, heavy lines.)

Tighten the stitch by drawing the free end of the lacing taut. (Fig. 16-D.) Repeat the lacing until all of the holes are laced. Finish off the free end of the lacing by passing it back through the last three stitches. (Fig. 16-E.)

LANYARD

Spiral Design for Thong Plaiting (Figs. 17, 18, and 19).

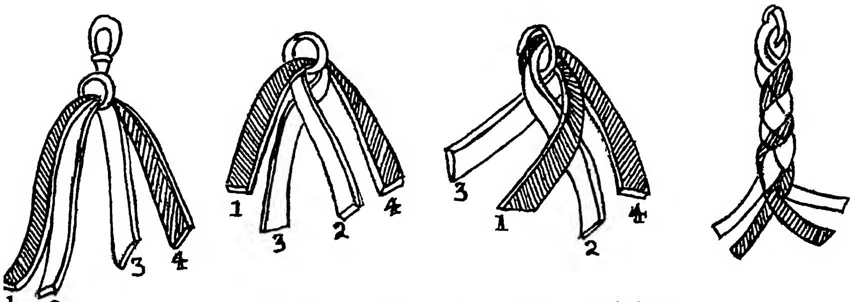


Fig. 17—Spiral Design for Thong Plaiting

After completing the desired length, separate the thongs for formation of the crown. (Fig. 18-B (3).

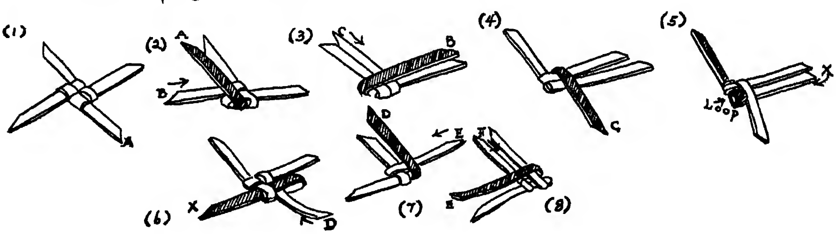


Fig. 18—Lanyard

To construct the lanyard, slip the free end of the plaiting between the thongs and work the crown over for a bit. This will allow the lanyard to slide for size adjustment.

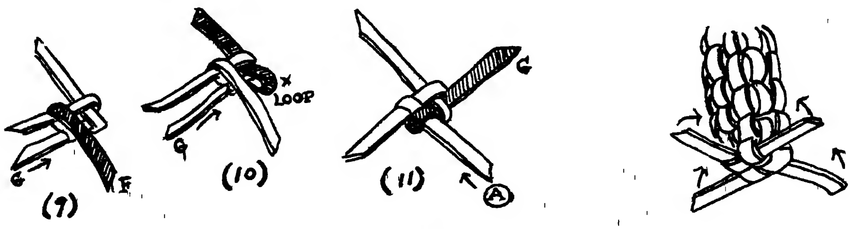


Fig. 19—Lanyard

To weave lanyard—cross 2 over 3 then pass 1 under 2 and 3 and over 2—next pass 4 under 1 and 2 then over 1. Continue by passing 3 under 1 and 4 and over 1. Weave with first strand on left then with first on right—always passing under two strands and back over second strand.

To end, weave the ends back through the last two rows and cement (Fig. 19.)

Suggested projects: purse handles, watch fobs, bracelets, buttons, necklaces, dog leashes, whistle lanyards.

PROJECT—COIN PURSE

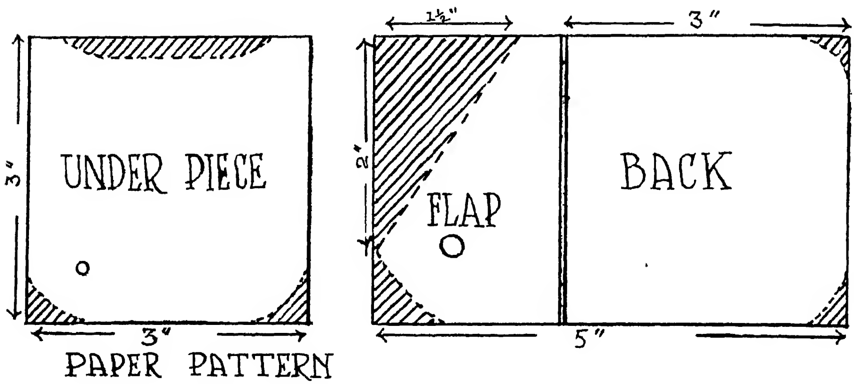


Fig. 20—Paper Pattern for Coin Purse

Draw a paper pattern. (Fig. 20.)

Place the paper pattern over the leather as shown in Fig. 21. Mark the pattern with a scriber, bearing down for a clear impression.

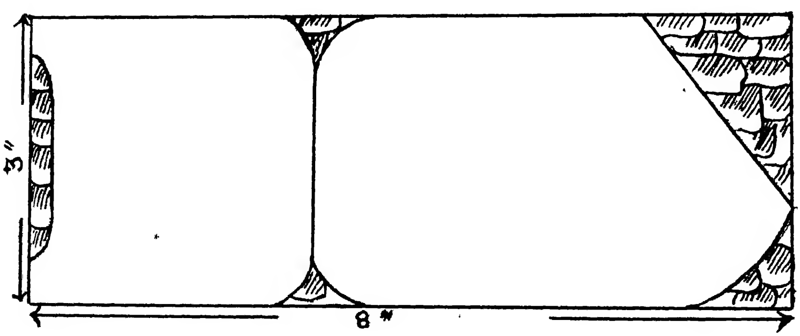


Fig. 21—Coin Purse. Paper Pattern laced Over Leather.

Cut the outline with a sharp knife, using a steel ruler for a guide in order to get true clean edges.

Tool design on cover. Cement the edges of the two sections of leather together. Punch a hole in each of the corners and hold in place with pieces of string. Continue punching holes around the purse. Punch the large and small holes for the snap button.

Attach the snap pieces by following the instructions for setting a snap button which will be found in this chapter.

Lace around the purse, starting at the point marked with an X on Fig. 22.

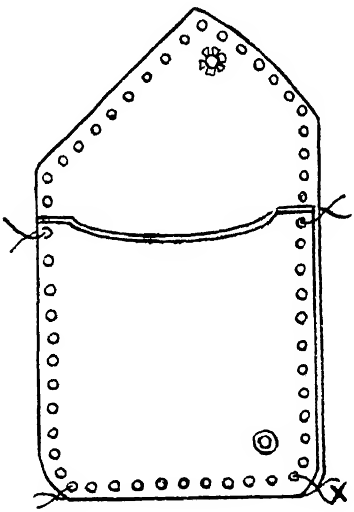


Fig. 22—Lacing Coin Purse

Fig. 23—Completed Coin Purse

Wax with saddle soap and polish with a soft cloth.

See Fig. 23 for sketch of a completed coin purse.

CHAPTER X

Working in Wood

WOODWORK HARDLY NEEDS any introduction to the layman. He is surrounded by samples of woodwork of one kind or another all of his life. His house is made of wood, as is his furniture and many of his playthings.

Any one desiring to work in wood may gain a lot of valuable information be studying such articles. Pay particular attention to the way they have been put together. See if the various parts are held together by nails, screws, dowels, glue, etc. Study the shape of the component parts in relation to the grain of the wood in each part. Examine the grain in a curved table leg or the arm of a chair. Find out whether the curved pieces were sawed or bent. Older pieces of furniture that were "built solid" often display a lot of handwork that is missing in our modern veneer, chrome, and plastic furniture. These modern bent veneer pieces require special tools beyond the reach of most craftsmen. (Figs. 1, 2, 3, 4 and 5.)

The subject of grain is of paramount importance in all of the processes involved in woodworking. The grain of the wood must be considered in designing an article, as well as in the size and shape of each part. The grain of the wood governs the kind of saw we use. We plane with the grain, sand with it, paint and varnish with it, etc.

A tree has three major parts: roots, trunk and crown. The trunk or stem of the tree is our source of lumber.

If we saw a tree through and examine the end of the cut we find that we have a cross-section of the trunk.

In the centre we find a dark core. This is called the heartwood and consists of dead cells that are often brittle or pulpy. This heartwood has little value to the woodworker beyond the ornamental figuration which small amounts of it will create when included in a board of sapwood.

The lighter wood surrounding the heartwood and extending to the inner side of the bark is called the sapwood. Sapwood is what we get when we buy a board from the lumber yard.

Between the sapwood and the bark there is a thin, green, more or less shiny layer, called the cambium.

Outside of the cambium is the bark, familiar to all of us.

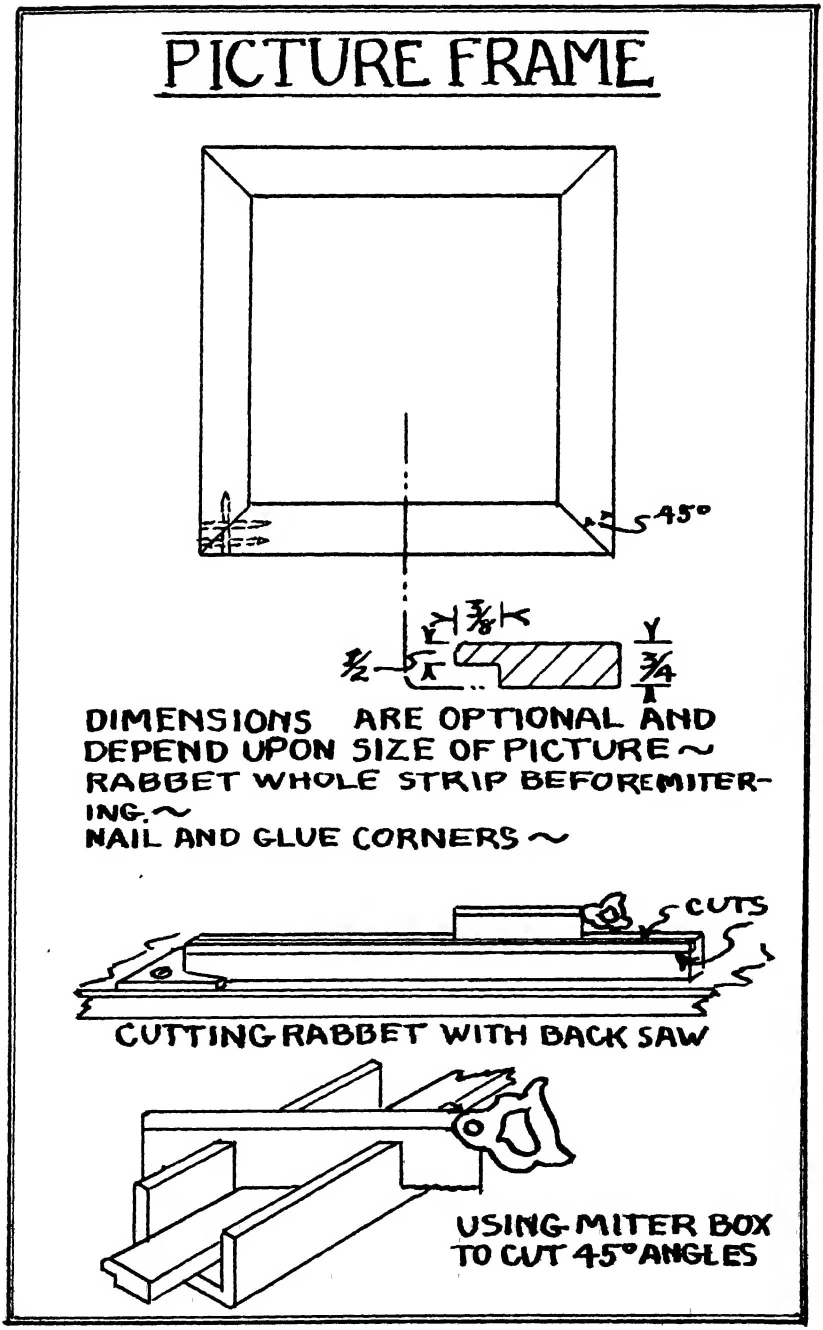

PICTURE FRAME
45°
3/8
1/2
3/4
DIMENSIONS ARE OPTIONAL AND DEPEND UPON SIZE OF PICTURE ~
RABBET WHOLE STRIP BEFORE MITER-ING. ~
NAIL AND GLUE CORNERS ~
CUTS
CUTTING RABBET WITH BACK SAW
USING MITER BOX TO CUT 45° ANGLES

Fig. 1

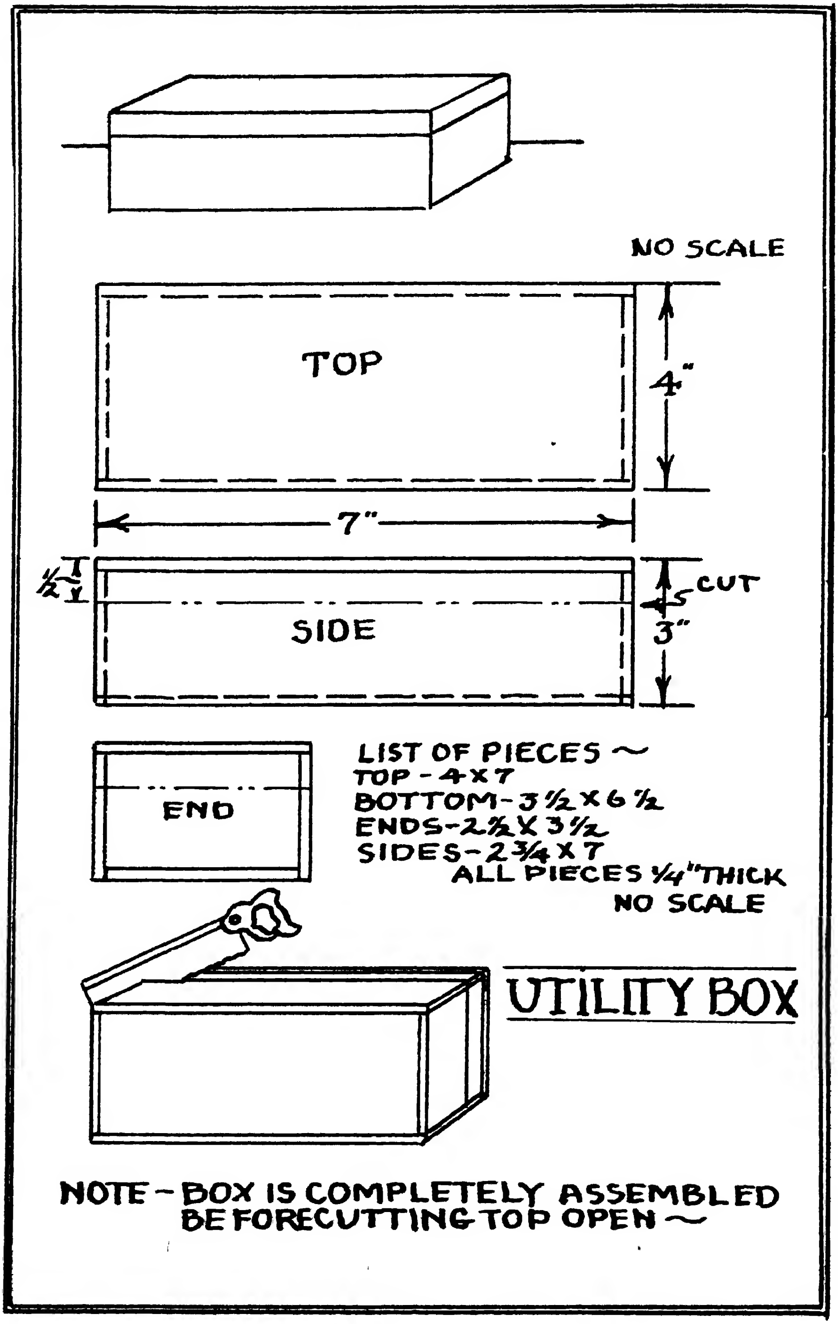

NO SCALE
TOP
4"
7"
1/2
SIDE
CUT
3"
END
LIST OF PIECES ~
TOP - 4 X 7
BOTTOM - 3 1/2 X 6 1/2
ENDS - 2 1/2 X 3 1/2
SIDES - 2 3/4 X 7
ALL PIECES 1/4" THICK
NO SCALE
UTILITY BOX
NOTE - BOX IS COMPLETELY ASSEMBLED BEFORE CUTTING TOP OPEN ~

Fig. 2

Now let us go back and study the sapwood a little more closely. We find it is made up of irregular concentric rings pretty much the same in appearance as the end of a roll of paper, except that the rings vary in thickness and are not nearly as regular as the layers of paper. Closer study of these rings will show thin layers alternating with thick layers. The thin rings show how much the tree grew in one summer. The thick rings indicate the spring growth. One thin and one thick ring make up the growth of the tree in one year, and, taken together, are called an annular ring By counting the number of annular rings one may determine the age of a tree. The green cambium is the latest annual ring in process of development.

In addition to the annual rings visible in the sapwood, one may also discern some radial lines that cut across the rings. These are called medullary rays and are more pronounced in hard woods than in the soft woods like pine and fir. The medullary rays are groups of cells arranged to store and carry food horizontally in the trunk of the tree. They act as switchovers that allow the sap rising in the long tubular cells of the annular rings to pass from one ring to another at intervals.

When a tree trunk is cut into boards, these annual rings and medullary rays appear as the grain on the surface of the board.

The way the boards are cut from a log determines the way these rings and rays will appear in the board, as well as the way the board will shrink or warp as its moisture content varies. The boards the ordinary lumber yard carries are usually plane cut.

This means that the log was squared and then sawed into parallel boards. Unless the craftsman specifies some other cut, plane cut lumber will be delivered. The other cuts include:

Tangential—A quarter section of the log is cut into boards parallel with the radius. This means that the centre radial board is the widest and the other boards are cut parallel to it and become increasingly narrower.

Radial—The boards are all cut radial to the center of the log and parallel to the medullary rays. This is an expensive cut, as there is a thin wedge-shaped board wasted between each usable board.

Quarter-Sawed—A quarter section of a log is cut into boards parallel to the faces of the quarter. A board is cut from one face and the next board from the other face, then back to the first face again, and so on. Each board is narrower than the preceding board by the thickness of the last board cut.

Radial-cut lumber shrinks more uniformly and warps less than the other cuts in drying; quarter-sawed next, and plane cut the most.

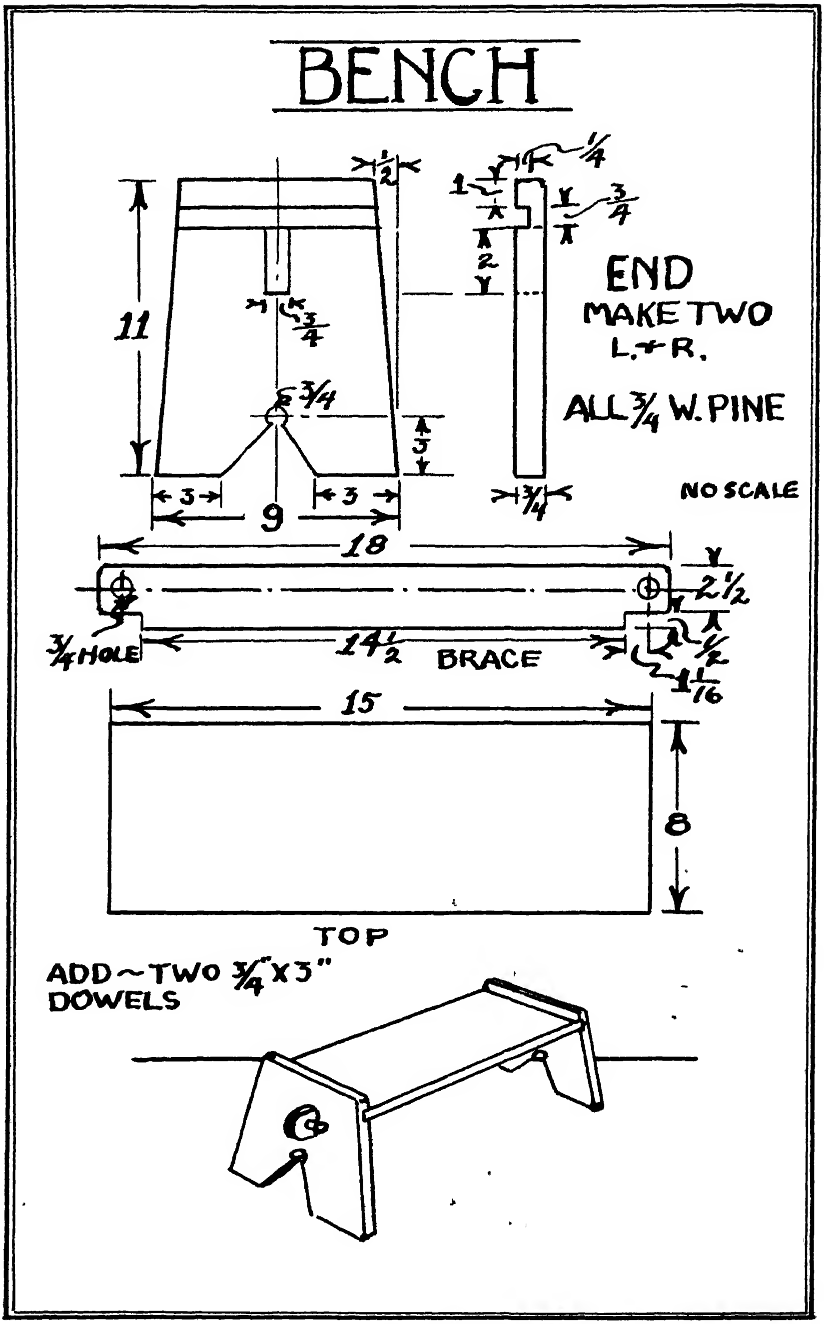

BENCH
1/2
1/4
1
3/4
2
END
MAKE TWO
L. & R.
11
3/4
3/4
ALL 3/4 W. PINE
3
3
3
9
3/4
NO SCALE
18
2 1/2
3/4 HOLE
14 1/2
BRACE
1/2
1 1/16
15
8
TOP
ADD ~ TWO 3/4" X 3"
DOWELS

Fig. 3

After the boards have been cut, they are seasoned. The moisture content is partly removed either by storing in a dry place for several months or by baking in an oven. The first process is called air-dried and the second kiln-dried. Most wood is seasoned by a combination of these two methods.

The seasoning of wood is one of the most important processes in the preparation of lumber. If this is not properly done the wood will shrink, warp, and split while, or after, it has been worked.

The craftsman should insist upon kiln-dried lumber when ordering.

The quality of wood varies from tree to tree, and, in the same tree, some boards contain knots, and others show streaks of heartwood or bruises and mineral stains.

Lumber dealers grade their wood according to the following standards:

Number I—Almost perfect. There may be small blemishes in large pieces but they should not show more than one inch of heartwood or more than one small sound knot or discolouration per board.

Number II—This grade permits one or two sound knots, one inch of heartwood, and one other blemish.

Common—These may show three or four sound knots, but two-thirds of one side must be clear.

Culls—Lowest grade of lumber. One-half of one side must be usable.

It is not necessary to buy the number one grade for all of your work. Small discolourations and a few tight knots in no way impair the strength of the cheaper grades.

It is, however, a mistake to expect a beginner to do good work with the lowest grades of salvaged and scrap lumber. The novice has enough problems learning how to handle tools properly, without burdening him with the difficulties encountered in working with poorly seasoned wood full of knots.

If you order lumber in any quantity, ask for random widths. If you ask for certain widths and lengths, the price will be higher to cover sorting or re-sawing. Wide boards cost more than narrow ones. A board ten inches wide will cost more than two boards five inches in width. Standard lumber runs from ten feet to twenty-four feet in length in multiples of two feet. Any odd length will cost extra. The widths are multiples of one inch. All boards one inch thick or less cost the same as a one-inch board.

The dimensions of rough cut lumber are full size. That is, a board 1″ × 8″ × 10′ rough, will be about ¾″ × 7¾″ × 10′ if ordered dressed on four sides (D4S). If you want lumber dressed full size, you will have to pay for the next larger sized dressed down to the dimensions you desire.

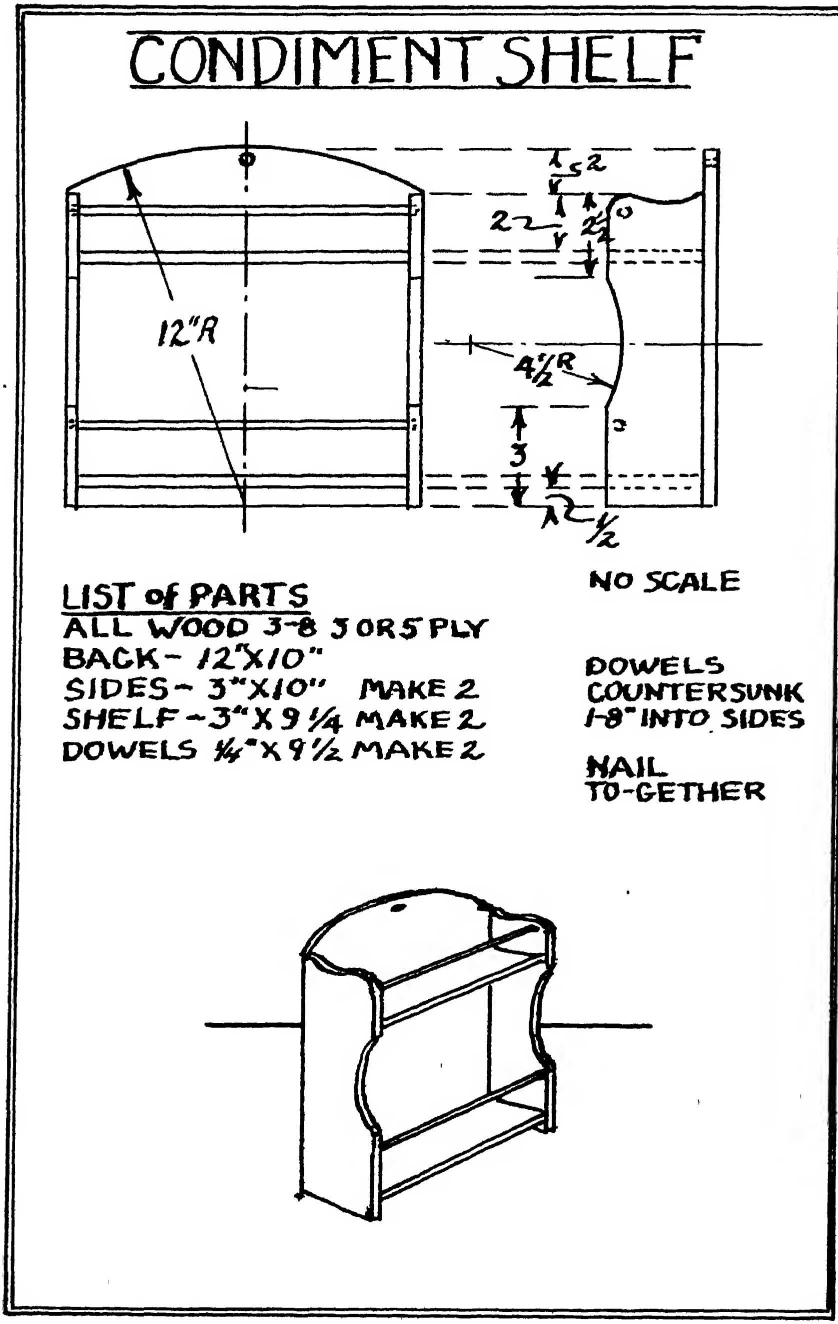

CONDIMENT SHELF
12"R
4½R
NO SCALE
LIST of PARTS
ALL WOOD 3-8 3 OR 5 PLY
BACK- 12"X10"
SIDES- 3"X10" MAKE 2
SHELF-3"X 9¼ MAKE 2
DOWELS ¼"X 9½ MAKE 2
DOWELS
COUNTERSUNK
1-8" INTO SIDES
NAIL
TO-GETHER

Fig. 4

A comparatively recent addition to the woodworking industry is plywood. These are panels of laminated wood from $\frac{1}{16}''$ to $1''$ or more in thickness. They consist of an odd number of thin sheets of wood glued together with the grains alternating, so that the grain of one layer is at a right angle to the grain of the next layer. The result is a thin wide panel of wood stronger than any solid wood could be.

There are also a number of pre-fabricated shapes in the lumber dealer's stock that are of interest to the craftsman, such as mouldings, beading, firring strips, dowels, etc. The woodworker can learn a great deal by a visit to a friendly lumber yard.

GENERAL PROCESSES

Most of the operations in handcraft work are performed in the same order. Whether you are working in wood, metal, plastics or leather, the method of procedure is the same. The materials have different characteristics. The tools and techniques may vary but the procedure follows a basic pattern.

We need a design, either one of our own creation or a copy of some existing project. After we have decided what we are going to make, we must figure out how we are going to make it. We decide such questions as, is it going to be built all of one piece or made of several pieces? We decide the size and shape of the parts and their relation to the project as a whole. These notes, drawings and calculations become our plan of attack. Here again we can use someone else's plan or have a lot more fun figuring out our own.

After our plan has been established, we proceed to prepare our materials.

The first operation is usually "parting." In woodwork, this means we cut off pieces of wood from our stock supply, a little larger and approximately the size of the parts specified in our plan. The principal parting tool used in woodwork is the saw. In other crafts it may be a knife or shears.

After the pieces have been rough cut from stock, they are sized, shaped and surfaced. This means that each piece is worked down to the final size and shape. This work is done with finer saws, planes, chisels, bits, etc. All the edges and surfaces are cleaned and sanded while they are still accessible.

Assembly—the parts are now joined. Glue, screws, nails or dowels or a combination of these methods are used, depending upon the project. We would probably nail a henhouse together, use screws or rivets on a small boat, and glue and dowels on a piece of furniture.

Finishing—the last general operation is the final finishing. Here again

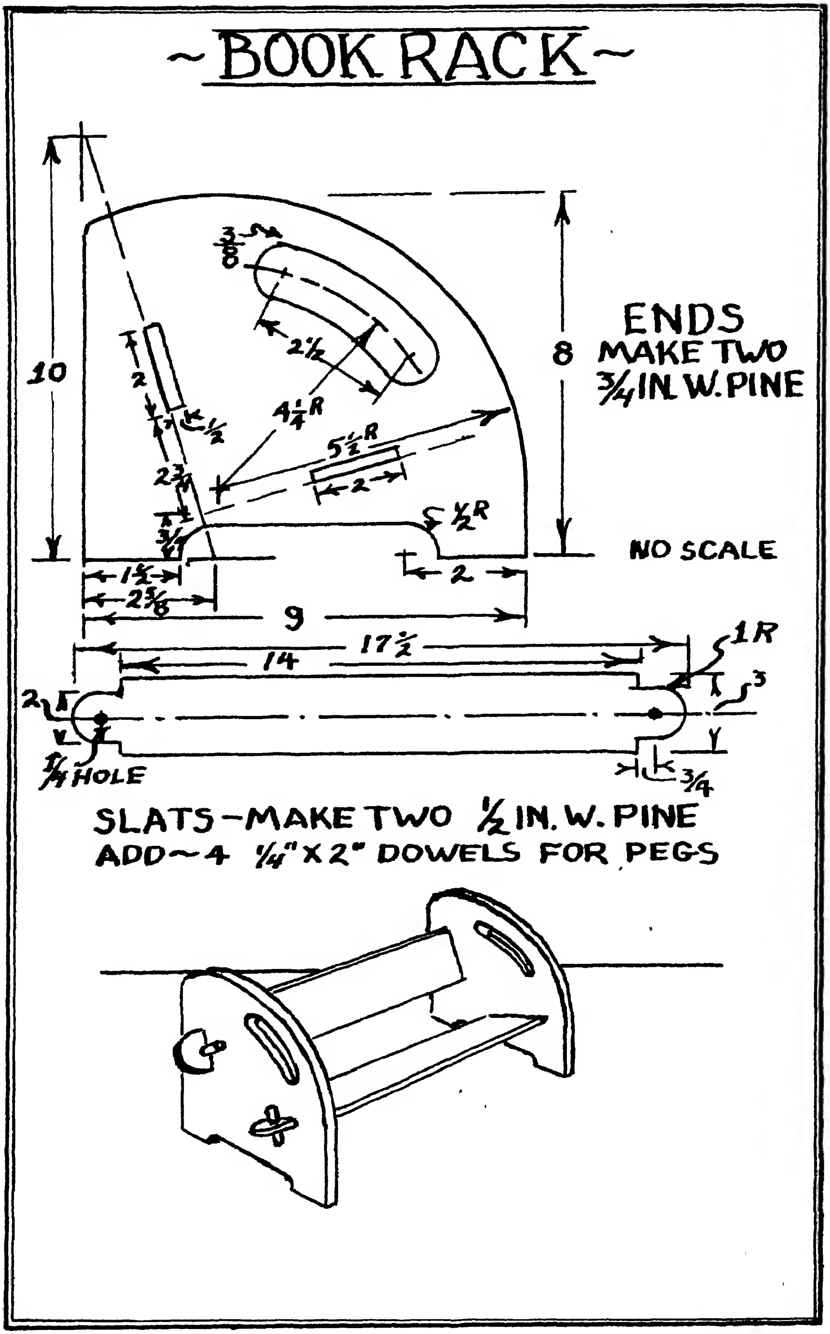

~BOOK RACK~
ENDS
MAKE TWO
3/4 IN. W. PINE
NO SCALE
10
8
9
2
1/2
2 3/4
3/4
4 1/4 R
5 1/2 R
2 1/2
3/8
1/2 R
1 1/2
2 5/8
17 1/2
14
1 R
3
2
3/4
1/4 HOLE
SLATS—MAKE TWO 1/2 IN. W. PINE
ADD~4 1/4"X2" DOWELS FOR PEGS

Fig. 5

the kind of project determines the finish to be applied. This may include stains, paints, varnishes or wax.

The following is a list of the basic tools employed in woodwork, arranged according to their principal use. Many of these tools are, however, used for more than one purpose. For instance, the back saw is essentially used for trimming or sizing, as it leaves a fairly smooth end on a cut. The back saw may also be used to cut lengths of dowels or picture moulding, and could then be called a parting tool.

Planning Tools: Drawing board, "T" square and triangles, drawing instruments, ruler, try-square.

Parting Tools: Saws—14″ back saw; Cross-cut—8 point (18″—20″); Rip—5½ point (18″—20″); coping saw frame and blades; keyhole saw.

SIZING TOOLS (SHAPING)

Edged Tools: Planes—Smooth, 10″; Block, 6″.

Chisels. Firmer, ⅛″, ¼″, ⅜″, ½″, ⅞″; gouges, ¼″, ⅜″, ½″, ¾″; brace—5″ sweep; auger bits—#3-4-5-6-8-10-12-16; hand drill—chuck ¼″ to 0; jobber's twist drills—1/16″ to ¼″ by 1/32″.

Files. Flat bastard 10″, half-round bastard 10″, flat cabinet rasp 10″, half-round wood rasp 10″, saw files (6″ and 8″).

Knives: Pattern makers, sloyd #7 (2½″ blade), drawing (10″).

Finishing Tool: Sandpaper—6/0 "Wet or dry" or "Speedwet"; #1-½-1-½-2/0 ordinary.

Paint brushes, flat—1″-1½″-2″-½″ sash.

Paints, varnish, shellac, alcohol and turpentine.

Assembling Tools: 2½″ and 7″ wire "C" Clamps; 2½′ and 5′ carpenter's bar clamps; 14″ Jorgensen clamps; carpenter's vise, 2″ × 5″ × 10″, open 12″; screwdrivers, 4″ and 8″; claw hammers, 8 oz. and 12 oz.; combination carborundum stone, 1″ × 2″ × 8″ round edge slip stone, ½″ × 2″ × 4″; light machine oil; screws (wood, flathead, bright) ½″ #4, 1″ #8, 1½″ #10, 2″ #10; nails (finishing), ½″-1″-1½″-3″; dowels, ⅛″, ¼″, ⅜″, ½″, ¾″, 1″.

TECHNIQUES

Separating one piece of wood into several smaller pieces is usually done by sawing. The saws most often employed are the cross-cut and the rip-saws.

The cross-cut saw is so named because it is designed for cutting across the grain of the wood. It usually has more teeth to the inch than the rip-

saw and the teeth are like inverted V's that have been sharpened diagonally, giving the teeth fine points and cutting sides.

The rip-saw, as its name implies, is used for ripping boards lengthwise with the grain of the wood. The rip-saw has fewer teeth to the inch than the cross-cut saw. The teeth are sharpened straight across, with the front of the teeth straight up and down and a long slope on the back. Rip-saw teeth cut on the point only.

The third saw that is often used is the back or mitre saw. It is a short-bladed, fine, cross-cut saw with a stiff back.

PARTING—SAWING

Let us assume that we have a plan and have selected our wood and are ready to go to work.

The first step will be to prepare our various pieces of wood

Start by planing one edge of the board straight and square with the face of the board. This is to be our base-line from which to make our measurements.

The end of the board is probably not square and may have small checks and mineral stains in it. Use the try-square to draw a line at right angles to the straight or working edge as near the end as is practical. This line should separate the usable wood from the scrap and establish another working line—the working end.

Saw the scrap section off the board. We are going to saw the grain, so we use the cross-cut saw. Place the board on a table or bench at a comfortable height, with the part to be cut off extending over the end. Hold the saw in the right hand and over the far edge of the board. Guide the saw with the ball of the thumb of the left hand against the side of the saw while you make one backward stroke. This scores a notch in the edge of the board that forms a guide for subsequent strokes of the saw. The saw cut should be made just outside the pencil line in what is to be the scrapwood. The line should still show on the work after sawing. If the saw is sharp, it will cut by its own weight. Great pressure is not necessary. Hold the saw at about a 60 degree angle to the face of the board and take long rhythmic strokes, watching the line and guiding the saw as you cut. As the saw slot or kerf approaches the near edge, it is necessary to support the overhanging piece to prevent it from splitting off and spoiling the rest of the board.

We now have a board with one straight edge and one square end. Measure from the line at the end, the length of the first piece. Use the try-

square against the working edge to draw this second line straight across the board. Cut the first piece off. Cut outside of the line but close to it. If another piece is to be cut from the board, check the new end with the try-square. If we did not cut straight when we separated the first piece, it will be necessary to draw a new right angle line and trim the end again as we did in the first cut. If, however, the end is square, we can measure from it for our second piece of wood. Proceeding in this way we cut our board into the desired number of pieces, each a little longer than specified in the plans—longer because we cut outside of the lines each time.

The next step is to smooth and square the ends of each piece with the block plane. Assume for the moment that this has been done and let us continue to talk about saws, although this planing operation is done before we do any more sawing.

We seldom use the full width of a board as it comes from the mill because the edges are usually nicked and stained from handling. If our finished piece is to be only a small fraction of an inch narrower than the milled board, we plane it down to the required width. If, however, the board is much wider than the piece we want, we use a rip-saw to cut the narrow pieces.

Draw a line parallel with the working edge and saw just outside of the line with the rip-saw. It is sometimes rather difficult to hold the "good" part of the board to the bench. After the piece has been ripped nearly to the width we want, we plane down to the line.

In our list of saws we mentioned three other kinds—back, keyhole, and coping saws. We have already described the appearance of the back saw. It is used primarily for finishing cuts in mitreing, rabbeting and other joining where no other work is to be done on the cut. The blade of the keyhole or compass saw is long, narrow and tapering. It is used for cutting relatively large curves with or across the grain. The coping saw has a "U" shaped frame with removable narrow blades and is used for scroll work, jigsaw puzzles, etc.

SHAPING—PLANES

There are two types of planes available in a number of sizes that the beginner in woodwork should know something about. The planes with high angle cutters are used for planing with the grain, either on the surface or the edge of boards, and the planes with low angle cutters for planing end grain, such as the end of a board.

The block planes for cross-grain cutting have a single blade set at a

relatively low angle in relation to the face of the plane. These blades are placed with the bevel side up and are held in place without a cap.

The other planes—smooth, jack jointer, etc.—for planing with the grain, have the blade set at a higher angle. The blade is set with the bevel down and provided with a cap to help stiffen the blade and break the shavings.

Study these planes. Take them apart. Learn how the adjustments are made and what the various parts are for.

The correct use of these planes requires practice. Experiment on a piece of scrapwood. Learn to hold the plane horizontally both fore and aft and side ways. Beginners have a tendency to plane uphill at the start and downward at the end of a cut. They also have a tendency to tip the plane to one side or another, with the result that the edge of the board is not square with the face.

Now let us return to the pieces of wood we have cut to length and find out why the ends should be planed before the board is sawed to its final width.

In planing the end of a board there is always danger of splitting off the last fraction of an inch or so as the plane finishes its cut. This can be avoided in two ways. If the board is wider than the final size called for by the plans, it is possible to bevel the corner opposite the working edge and thus prevent the wood from splitting. The board is then sawed or planed to width after the ends are square. The other method requires more skill and is used where there is no surplus width to the boards. It consists of planing from both edges toward the middle of the board.

If the plane has a tendency to dig into the wood, it may be because the cutter is set out too far or is dull, or because the grain of the wood is not parallel with the surface. If the cutter is sharp and adjusted properly, but still digs, try planing in another direction.

One important thing to remember in these and all subsequent operations is the matter of dimension lines. Never saw or plane through a dimension line. Theoretically, the centre of a dimension line is a true measurement. If we cut any of the line away, our dimension is lost and we have to measure over again, making our object that much smaller. The ideal situation is to remove half of the width of a line with the sawdust or shavings and leave the other half of the line on the finished piece.

SHAPING—KNIVES, CHISELS, ETC.

Our pieces are now all cut to size and squared up. The next step is shaping and any other modifications called for by the plans, such as boring holes, rounding corners, beading the edges, etc.

These operations require the use of chisels, gouges, brace and bits, etc.

Chisels and gouges are both used in the same manner. For light cutting, one hand is placed on the handle in a position to push. This is the power hand. The other hand is placed on the blade of the tool with the heel of the hand resting on the work. This hand acts as a brake to guide the tool and prevent it from cutting too far.

Chisels, and their curved brothers, the gouges, are sharpened with a bevel on one side of the blade. The bevel side is always held down against the work except when cutting a convex face or for a final cleaning cut, when the tool is turned on its back and held very flat. Never pry shavings loose—cut them clean off.

Auger bits are used for boring holes in wood and are used in a brace which is held in position with one hand while being revolved with the other. This is a simple tool to master. The chief difficulty seems to be to bore holes at right angles to the face you are working on. Hold the brace in front of you. Get someone to stand to your right or left and thus make sure you are "square both ways." Avoid bending the bit once the hole has been started.

Never bore completely through a board from one side, as the wood is liable to split as the bit comes through. The proper procedure is to bore from one side until the spur or screw tip just shows on the other side; then back the bit out and bore from the other side, using this small spur hole as the centre for the bit.

PRELIMINARY FINISHING—SANDING

After all the parts are shaped, they are given a preliminary sanding. Each part is sanded smooth and clean while it is easy to handle. When the work has been assembled it is often difficult to sand in the corners, around spindles, etc.

The object of sanding is to make the work smooth and clean by removing the high spots, fuzz, scratches, etc.

All of the high spots have to be worn down to the lowest depression in the wood. As we want to remove the high spots, it is necessary to wrap the sandpaper around a hand-sized block of wood or piece of cork. In this way

the sandpaper will not run up and down the hills and valleys in the wood merely making the wood thinner, and still irregular, but will bridge across the high spots and wear them down.

The grade of sandpaper used depends upon the condition of the surface and the finish desired. If the wood is very rough or is end grain that has not been planed smooth, we may want to start with number 1½ grit and gradually work down to number 2/0. For most dressed lumber that is not too badly scarred, number ½ and then number 2/0 are sufficient.

Always sandpaper back and forth with the grain, never across it. If you sand across the grain, even once, you will cut some of the fibres in the wood and later, when you stain or varnish, these cut fibres will appear as ugly scars.

Always dust off the work when changing to a finer paper so that none of the coarse grains get stuck on the fine paper and scratch the work.

Take care to keep all the edges nice and sharp unless, of course, they are supposed to be definitely round. This is important in the finished appearance of the work.

Sometimes there is a dent in the surface caused by an accidental blow of the hammer or mishandling. If the dent is not so deep that the fibres of the wood have been broken, it may be remedied. Moisten the dent by putting a small wet rag or piece of paper on it. This causes the dent to swell out so that it may be sanded flat.

ASSEMBLING

All the parts are now finished and ready to be put together.

The order in which they are assembled is largely a matter of common sense. We build from the ground up and put the inside pieces in place before the outside is finished. Occasionally there are sub-assemblies to be made, such as cleats for shelves, rungs for the arm of a chair, etc., before making the final assembly.

The methods employed to join the various parts depend upon such factors as the skill of the craftsman, the kind of article and the use to which it is to be put. A shelf in the cellar to hold laundry supplies can be nailed in place. A shelf in the kitchen for spices might be held in place with screws and, if the shelf is to be placed outside the window for a flower box, the screws should be galvanised to prevent rusting. A shelf in the living room for books should be nicely finished and assembled with hidden fastenings—dowels and glue or countersunk screws—set in from the back or underside.

Dowels and glue are used for most cabinets and bright work, *i.e.*, varnished and stained wood.

The dowel holes are carefully placed and do not show on the outside of the finished work. After the holes have been carefully spotted and bored, the work is assembled to see if everything is going to fit, and then taken apart again. Glue is applied to both ends of all the dowels and joining surfaces and the work reassembled and clamped or tied together until the glue has set.

GLUING

There are a number of glues for wood on the market: hot glues, animal and fish glues, casein and resin glues, etc. The modern casein and phenol-resin (bakelite) glues are the most convenient for amateur craftsmen. They are mixed with cold water according to the instructions on the containers. The casein glues are water-resistant but will sometimes stain coloured woods, like mahogany. The bakelite glues are stain free and water proof when dry.

Apply the glue with a stick or brush, and wipe off the excess with a damp cloth as soon as the parts have been clamped together. Glue that has set is very difficult to remove, and, if left on the work, will show through any finishing stains.

A word of caution about dowels; they should not be too tight when dry, as they swell when wet with glue, and, besides squeezing the glue out of the holes, may swell enough to split the wood.

SCREWS

Another common method of joining wood is by the use of screws. The screws most often employed have flat heads and are countersunk into the work so that the head is flush with the surface, or set down far enough to permit the head of the screws to be covered with putty or a plug.

When using wood screws, drill a pilot hole first with the hand drill and a twist drill a little smaller than the core of the thread on the screw. A larger drill is then passed through the top piece of wood to accommodate the shank of the screw. A countersink is then used to make the large hole big enough to receive the screw head. This sounds like quite a lengthy process although it goes quite rapidly if several holes are drilled each time before changing drills.

A stronger joint is made if glue is used on the joining faces along with the screws.

FINISHING

The final finish given to the work is also dependent upon the project and its purpose.

Sometimes we just slap on a coat of paint to protect the wood. Or, we build up an eggshell or porcelain finish by applying several coats of enamel, rubbing the surface smooth between each coat with very fine sandpaper.

Bright finishes are produced by building up several layers of varnish in the same manner.

Often the work must be stained to harmonise with other objects of furniture. The most satisfactory results are achieved by staining the raw wood with prepared oil stains and then building up the surface with varnish. The oil stains can be made or modified at home by thinning small amounts of artist's colours ground in oil with turpentine. The stains are applied with a brush or rag and the surplus wiped off with a clean cloth.

A substitute for oil stains in small quantities can be made by dissolving wax crayons in turpentine. This wax solution is not suitable for highly finished work.

There are also prepared varnish stains that are supposed to stain and varnish the work at the same time. These varnish stains never give the finish that oil stains and varnish produce.

WHITTLING AND WOODCARVING

Carving is an art which began almost as far back as man himself. One may see evidence of this in the primitive carvings on display in the museums. There you may see the carved paddles of the natives of the East Indies, the ceremonial dolls and the totem poles of the American Indians, the spoons, bowls, etc., of the Eskimos, and countless other objects of art and utility.

TOOLS

Whittling and carving, with the exception of the tools used, are almost identical. Whittling depends primarily on the use of the knife and may consist of simply cutting shavings, or the carving of objects of art. The tools used for carving are chisels of various shapes and sizes.

The most necessary qualifications for the beginner are the desire and the urge to carve. With these, and some perseverance, carving will soon be an accomplishment.

Because it is easier to master the technique of using only one tool rather than several, it is advisable to start with whittling. In the hands of a skilled craftsman, the knife becomes a tool that will do almost everything that is possible to do with a more costly set of tools.

WHITTLING TOOLS

Many whittlers prefer to use a pocketknife with two or three blades. There should be a large, strong blade for heavy, rough work and smaller blades for fine detail cutting. Some whittlers use a number of knives with various shaped blades. However, this is not absolutely necessary. In selecting a knife, take the one that feels comfortable and balanced in the hand.

SHARPENING TOOLS

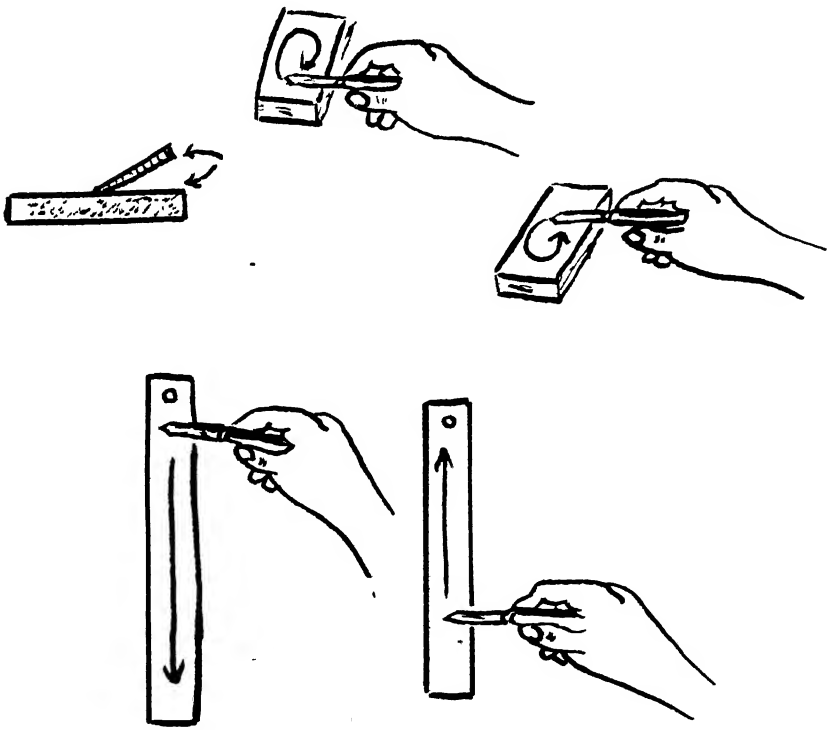


Fig. 6—Sharpening Tools

It will also be necessary to get an abrasive for sharpening the knife. (Fig. 6.) There are many kinds of oilstone which may be used for this purpose. A combination carborundum is best It gives dual service, being fine on one side and coarse on the other.

To sharpen, apply a light machine oil to the face of the stone. This prevents the stone from becoming clogged with particles of steel which wear off the blade in the process of sharpening. Place the side of the knife blade flat on the stone. Raise the back edge about 15 degrees, and, in the circular motion, move the blade toward the cutting edge. Unless the blade is very dull, the weight of the hand should provide sufficient pressure. Repeat the process for the other side of the blade. A fine razor edge may be obtained by stropping on a piece of leather after using the stone. To test for sharpness, draw the ball of the thumb across the cutting edge at right angles. If the blade is sharp, a slight friction on the skin will be felt. Another way is to hold the knife under a light and look down at the cutting edge If it is truly sharp it will part the light rays. However, if it reflects the light, it is not sharp. This is a good way to test for fine nicks which might not be visible from the side of the blade.

WHITTLING

In cutting, the knife should be held in the second joints of the fingers. (Fig. 7.) With the cutting edge turned in, and by placing the thumb against the object to be carved, pressure is applied by gripping or closing the hand. In cutting outward, the knife is held in the same manner except that the cutting edge is turned outward and the thumb is placed on the back of the blade. By holding the work against the thumb of the hand holding the knife, controlled pressure may be applied.

There should be no forward pressure of the knife hand. Another method of cutting inward is to turn the cutting edge in and place the thumb on the side of the blade. By placing the thumb of the other hand against this, pressure is applied by using the blade as a lever. Bend the wrist of the knife hand outward. This forces the blade to cut toward you. A little practice will soon develop these methods of cutting. Great care must be taken to avoid injury. Accidents in whittling are caused by carelessness and can be avoided.

It is important to remember that the chips must be cut, not pried out. It is

much better to remove the surplus by using several small cuts rather than risk spoiling the work by cutting off more than was intended. Whittling requires patience.

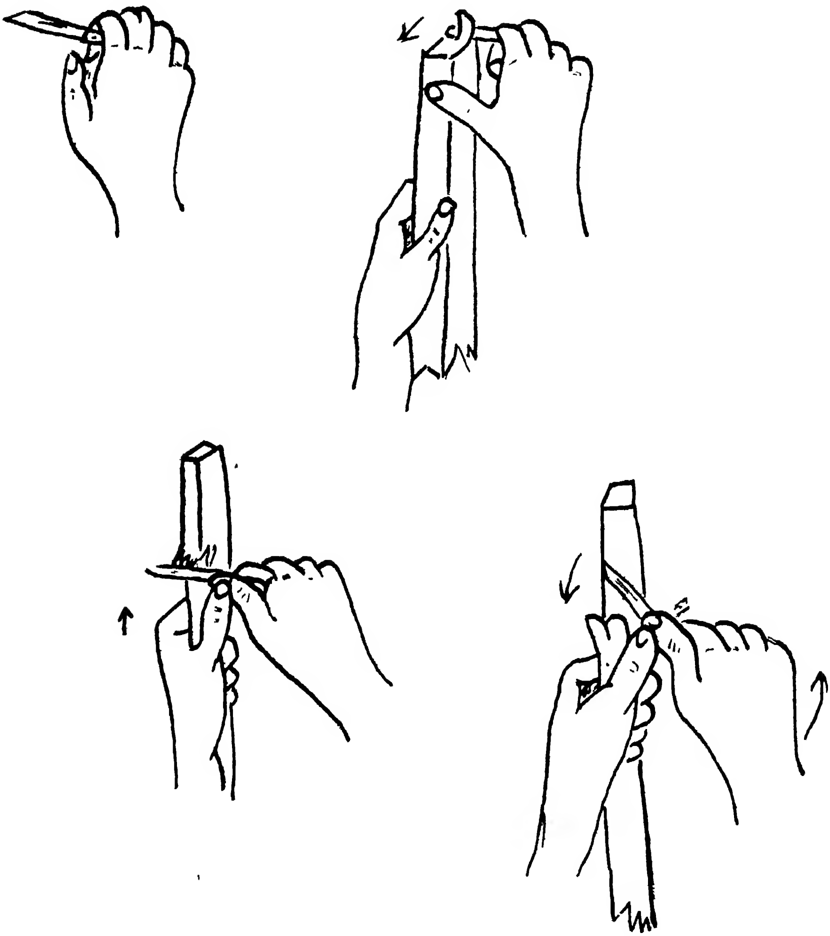


Fig. 7—Whittling

CARE OF TOOLS

After using the knife and before putting it away, wipe it with a cloth, to prevent rust from forming due to the moisture from the hands.

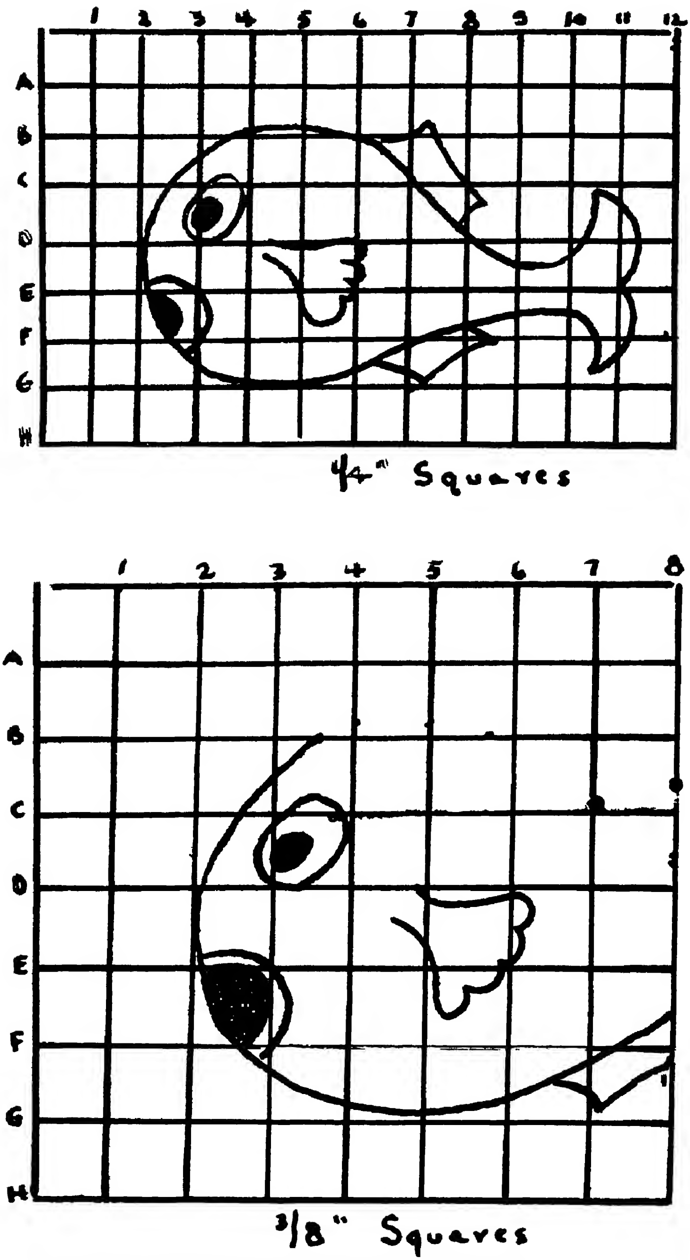


Fig. 8—Scale Drawings

SELECTING WOODS

Soft woods, such as white pine, sugar pine, poplar and basswood are most suitable for whittling, because they have a straight fine grain, which is not very prominent, and because they do not split open ahead of the blade. They also have enough strength in all directions to hold together no matter how finely whittled. Hard woods like oak, walnut and mahogany, although more difficult to work, can be used very effectively because of their beautiful grain and colour.

SUGGESTED PROJECTS

There are many things which can be carved with a knife: letter openers, forks, spoons, tricks, puzzles, papers and magazines often suggest objects and characters for the whittler. Children's illustrated story books are full of ideas.

SCALE DRAWINGS

In many cases it will probably be necessary to enlarge or reduce the size of the drawing. There are several ways of doing this, but for our purpose the method illustrated is easiest. (Fig. 8.) This is done by ruling squares of equal dimension on the original drawing or picture, and then preparing a paper for the enlargement by ruling squares of larger proportions. Assuming that the squares on the original are ¼″ (or ⅜″) and you wish to enlarge it to 1½ times the original size, the squares for the enlargement must measure ⅜″. For enlarging to twice the original size, make the squares measure ½″. To reduce the size, simply scale downward.

To make the enlargements, point off on the larger squares, using the same comparative proportions, wherever the original crosses the lines of the smaller squares. Next connect these points, taking care to follow the original drawing.

TOTEM POLE

A popular item for whittling is a miniature totem pole. (Fig. 9.) For the totem illustrated you will need a piece of soft wood ¾″ square and 6″ long. If you wish to make it twice the size, double these dimensions. The first step is to mark off the size of the figures so that they will be in the right proportions. It is advisable to use one corner as the front centre line.

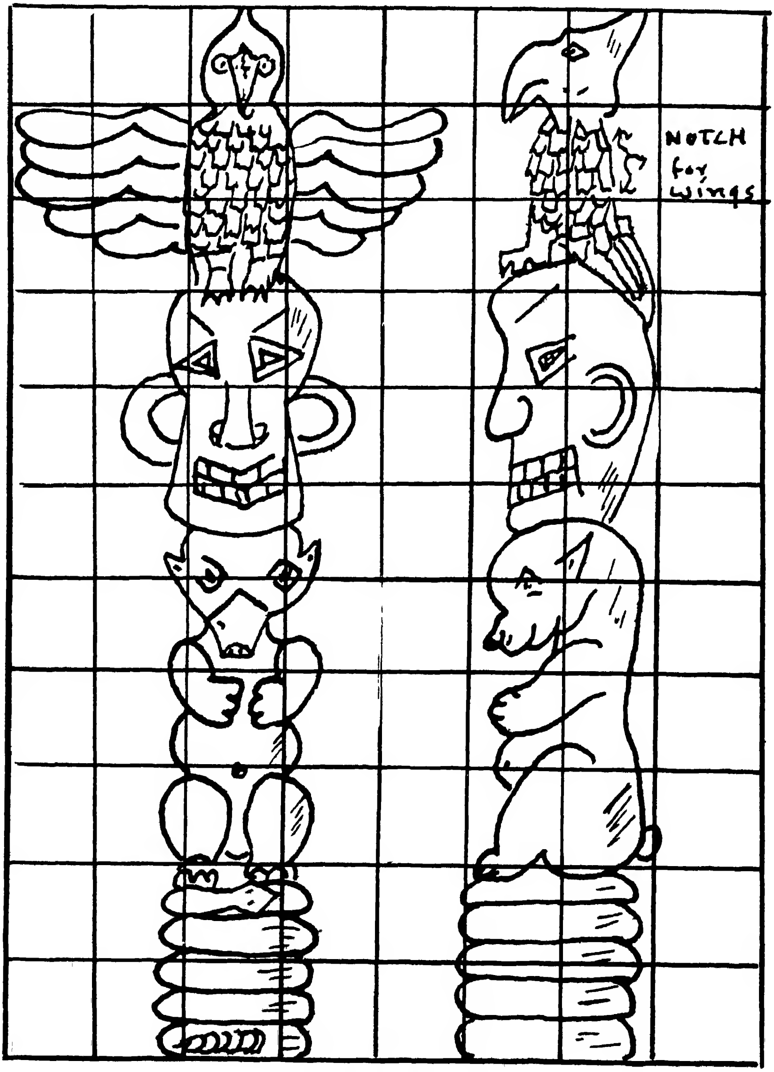


Fig. 9—Totem Pole

This gives you the angle for noses, beaks, etc. Also, there will be less to cut off than if the wood were used on the square. Rough out the entire pole before putting in any detail. The wings and ears are made separately and glued on. (Fig. 10.) Whether or not the pole is sandpapered is a matter of personal choice. Some whittlers prefer to show the knife cuts. To decorate, you can use crayons, water colours or artist oil paints. Of course, the oil paints are more durable and can be blended much better than the others.

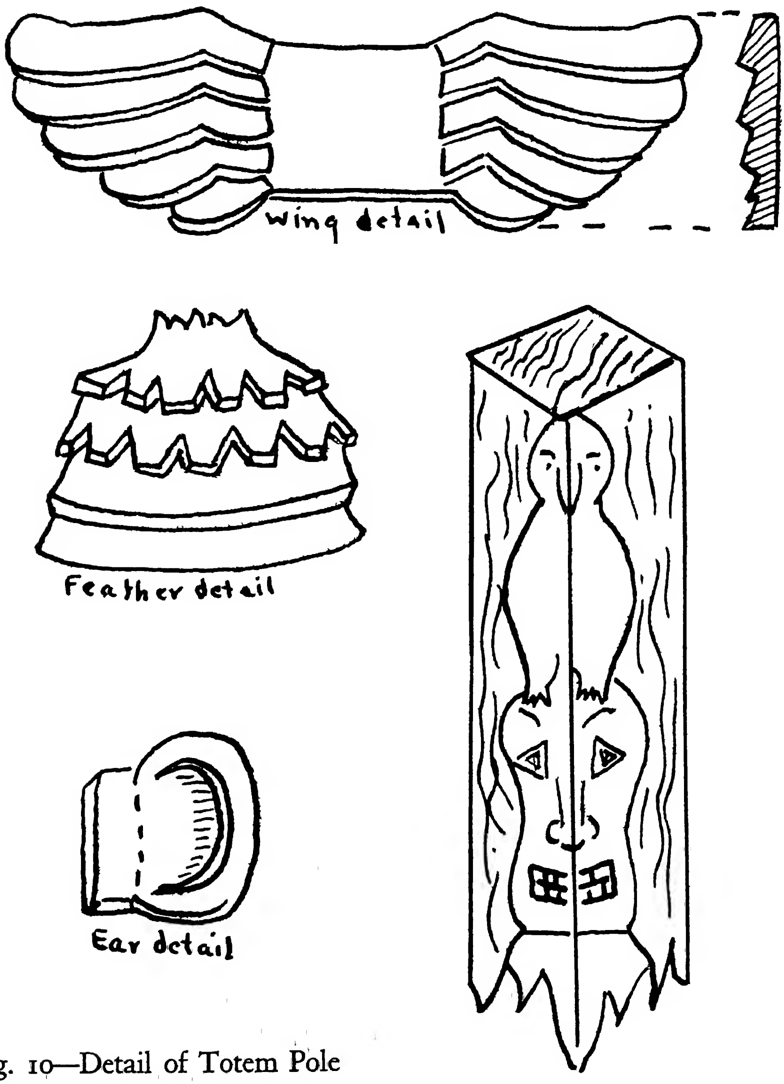


Fig. 10—Detail of Totem Pole

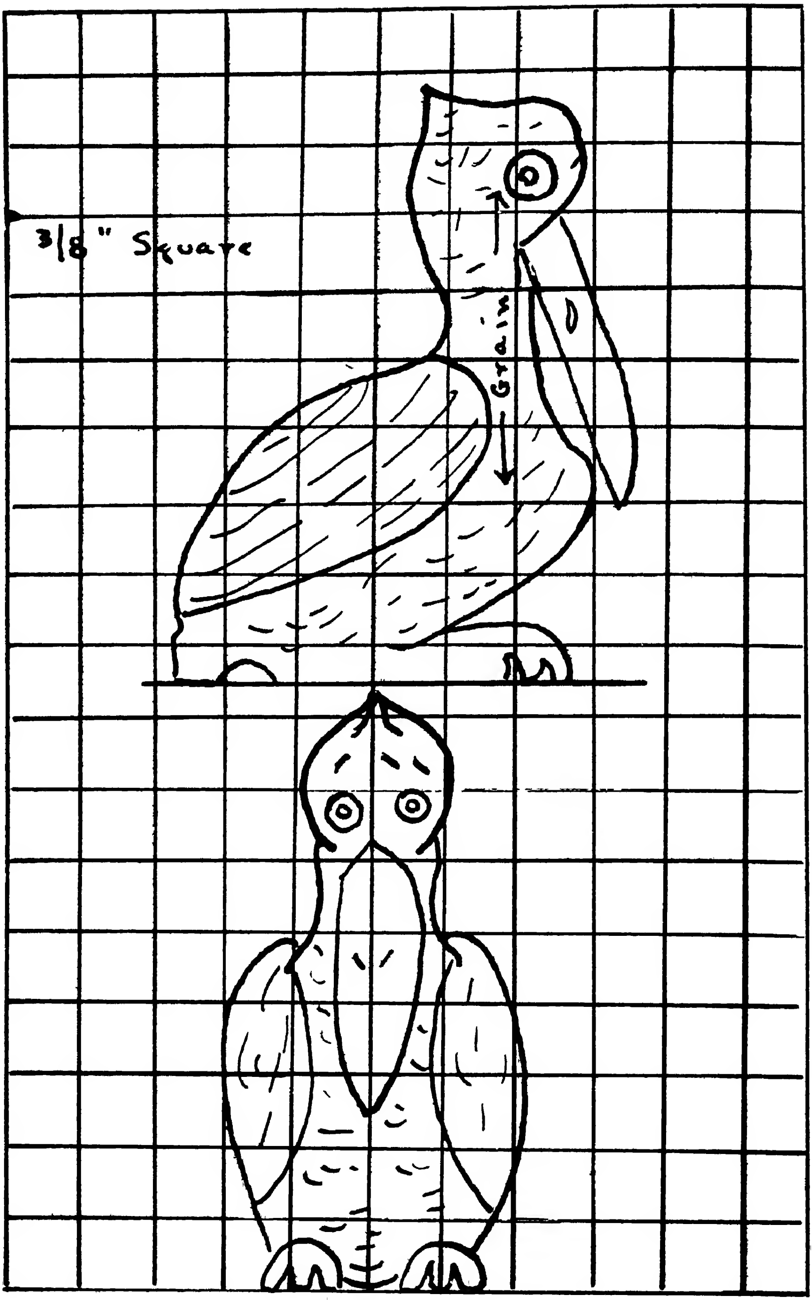


Fig. 11—Pelican

If you like a glossy finish, give the totem a coat of white shellac after the paints are dry. These miniatures make excellent decorations for paper weights, ash trays, etc

PELICAN

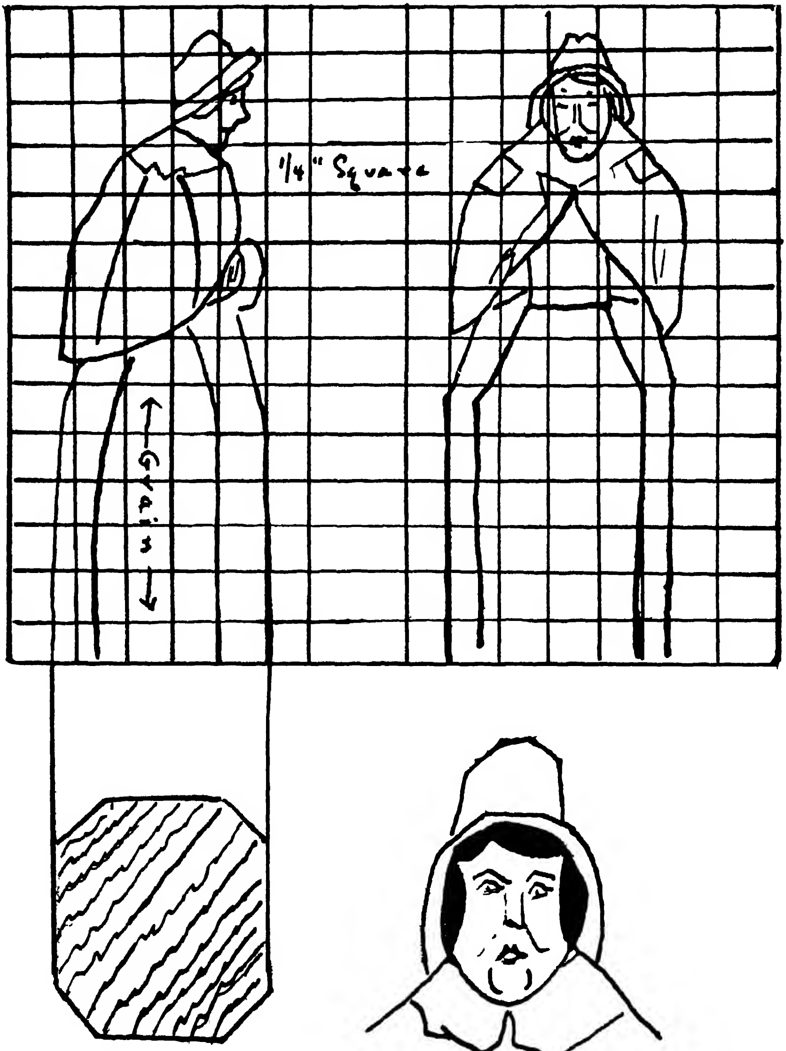
To make a pelican, use a piece of wood 3½″ × 3½″ and 1½″ thick. (Fig. 11.) First trace the profile of the drawing, and then, using carbon paper, transfer it to the wood. Be sure to lay out the design with the grain of the wood running the length of the figure. In any whittling work, it is important that this rule be followed. If the grain runs across the figure, there is danger of the figure breaking off at the thinnest parts. The strength of wood is in the length of the grain and not across it. After tracing the figure on the wood, cut off all surplus. This can be done with a coping-saw or jigsaw. Next sketch on the front view. This will be difficult to trace because of the uneven surface. When the surplus is taken off, you are ready to start modelling. First round off the corners and then outline the back and head. Make the cuts bold so that they will look like feathers.

Finishing

For the finish, it can be painted, stained or given two coats of white shellac. Another good way to finish is to soak the figure in boiled linseed oil for several days, and then dry and polish with powdered pumice or a talcum powder.

OLD LADY

To make the figure of the old lady, follow the same steps as in the pelican. (Fig. 12.) This is a stylized piece and is not rounded. Note that the corners are left angular. However, many variations can be made from this pattern.



Cross Section of Base

Head Detail

Fig. 12—Old Lady

JEWELRY

The jewelry illustrated is made from wood ¼″ thick. (Fig. 13.) A hard wood like walnut is best. The acorns are fastened with a leather thong. Pinbacks can be purchased for the brooches, although safety pins can be used for this purpose. Cut a groove in the back of the brooch large enough to hold one side of the pin and then cement it in place.

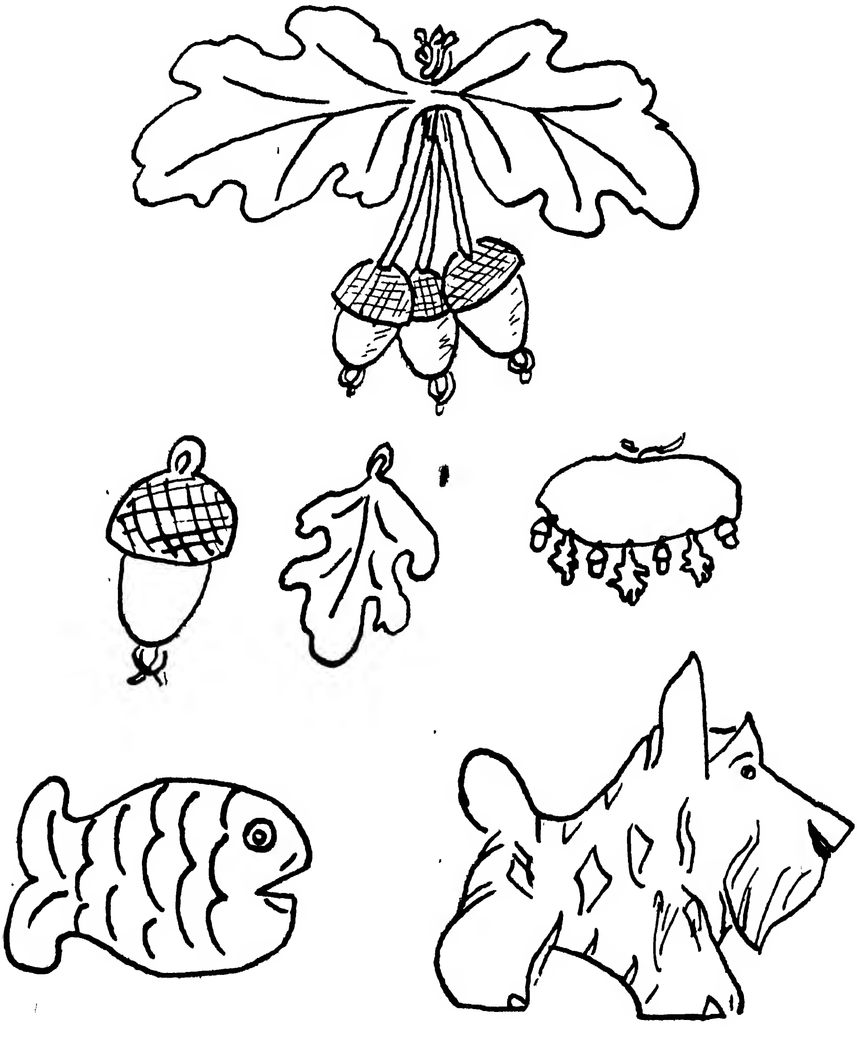


Fig. 13—Jewelry

CHIP CARVING

Chip carving is another form of carving which can be done with a pocket knife although this is not recommended for beginners, as there is danger of the knife closing on the fingers if it is not used properly

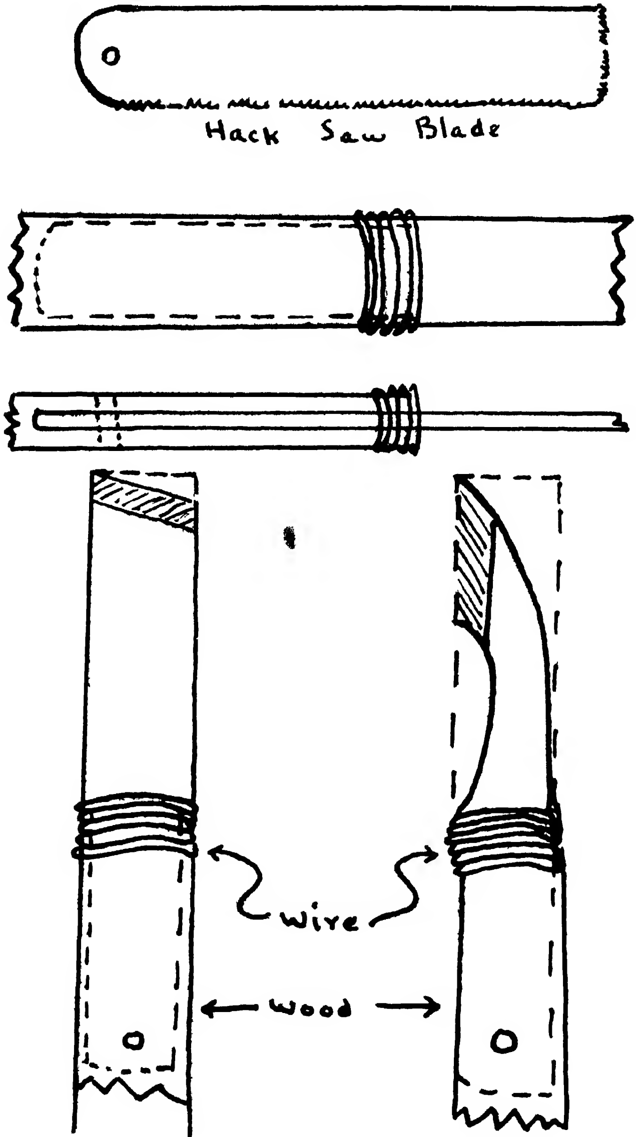


Fig. 14—Chip Carving Knives

Chip carving is one of the simplest ways of decorating wood. The designs are carved intaglio, i.e., cut down from the surface of the wood and usually consisting of geometrical patterns that can be done with a ruler and a triangle. This obviates the necessity of having to create designs for this kind of work.

Any close-grained wood can be used. Craft teachers usually recommend bass or poplar for beginners because these woods are soft and easy to work.

Professional chip carvers use two knives, one is a stick knife with a short, broad blade and its cutting edge on the end which is about fifteen degrees to the sides. (Fig. 14.) The other knife, the slicer, has a longer blade with a curved back and a thin straight cutting edge. (Fig. 14.) There is also on the market another knife that can be used for both sticking and slicing, as well as whittling and a number of other crafts. It is called a large stencil knife. The blade is about two inches long with a straight back and long diagonal cutting edge. The tip has been ground off at about sixty degrees to the cutting edge to remove a fine point that might break easily.

The designs are created directly on the wood with a soft pencil, or may be worked out on paper first and transferred with a sheet of carbon paper. The simplest form of design consists of a series of isosceles triangles arranged in some pleasing pattern.

Let us assume we are working with only one knife—the large pattern maker's knife. Hold the knife blade vertical to the wood with the point just touching the apex of the triangle. (Fig. 15.) Move the blade until it coincides with one side of the triangle and press straight down until the tip has penetrated the wood an eighth of an inch or so at the apex, and make a cut along one side sloping up to the surface of the wood at the base of the triangle. Make a similar cut starting at the apex along the other side of the triangle. We now have a triangle bound by two vertical incisions that slope downward from the base line to a maximum depth at the apex where the cuts meet. The next step is to cut the triangular chip out. Hold the knife in the right hand with the first joints of the fingers resting on the board. (Fig. 15.) Place the point of the blade at the far end of the base line. Place the left hand on the work, with the index finger reaching over the blade and hooked on the back of the blade. Press forward with the right hand and pull slowly toward you with the index finger of the left hand. This sounds rather complicated but what we are trying to do is to make the back of the blade slide down the cut of the far side of the triangle until the slicing tip reaches the apex. If we are successful we will have a "chip," a triangular wedged shape piece of wood that actually falls out of

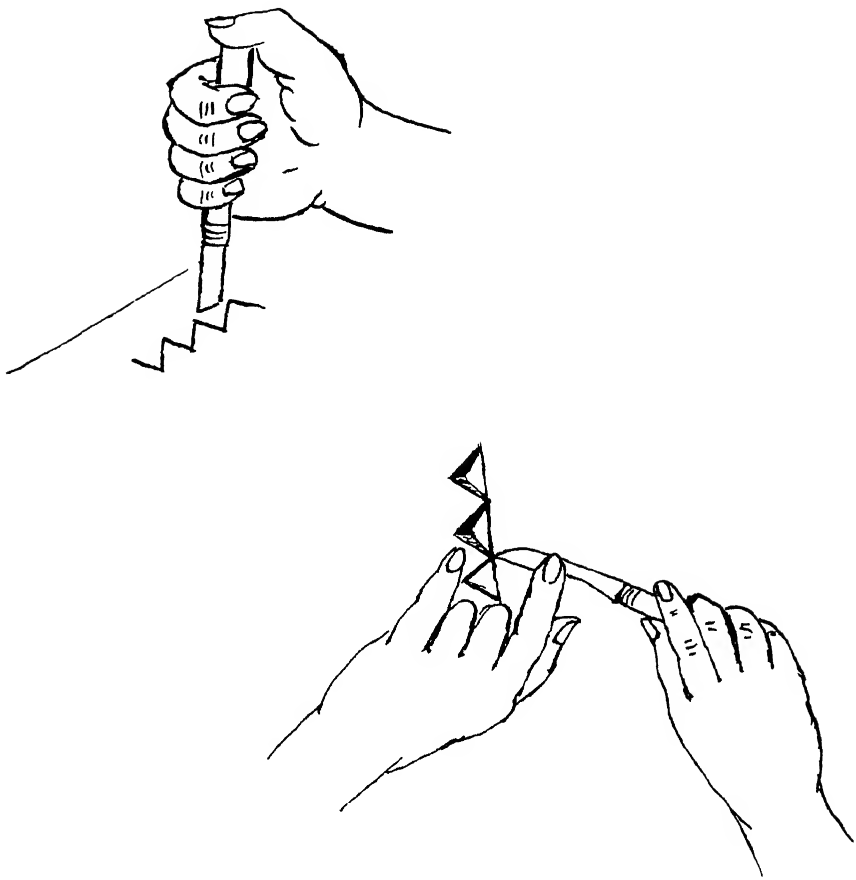


Fig. 15—Chip Carving

our work. If it does not, don't pry, but go back and slice again. These knives must be very sharp. Do not pry or scrape with them or you will ruin the blades.

After you have become proficient with the isosceles triangle, try other shaped triangles, rectangles, arcs, cords, etc. (Figs. 16 and 17.) The techniques are the same, even if the stick cut is one continuous line, rather than two sides of a triangle.

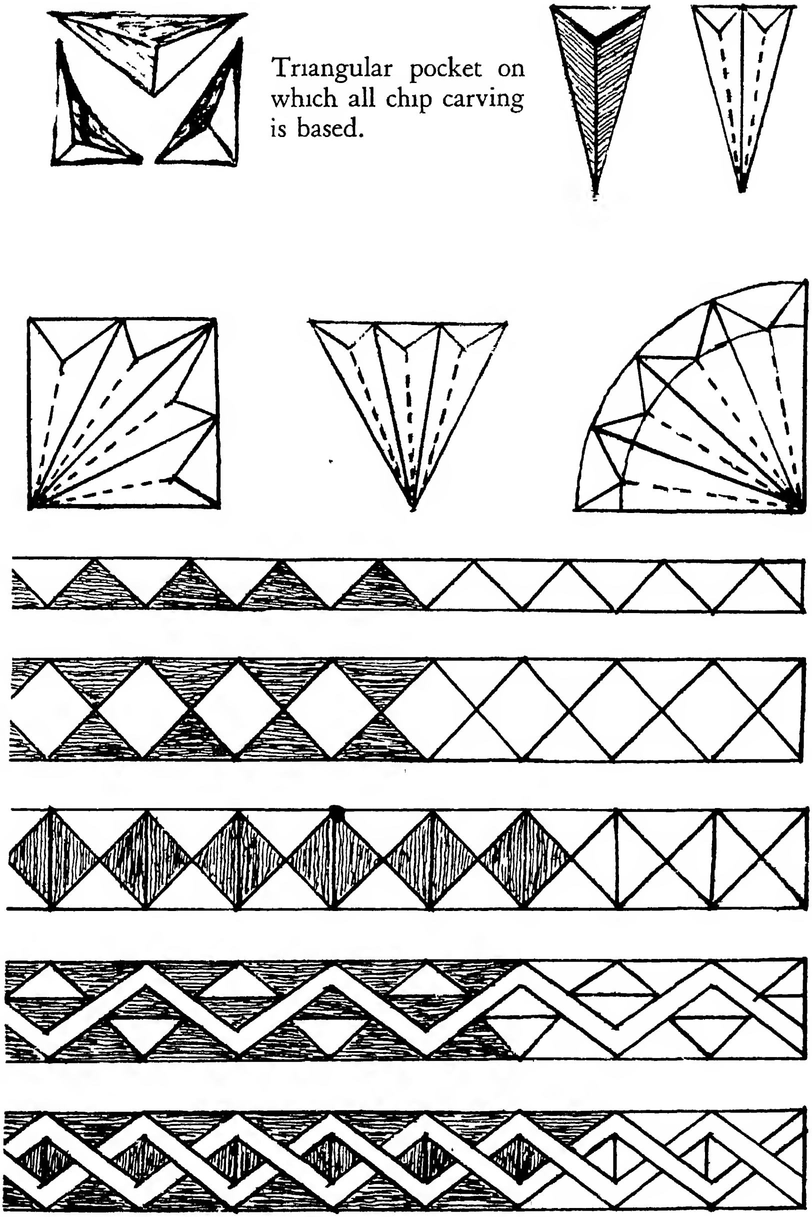


Fig. 16—Make the incisions on the dotted lines. The shaded areas in the borders are the parts that are lifted out.

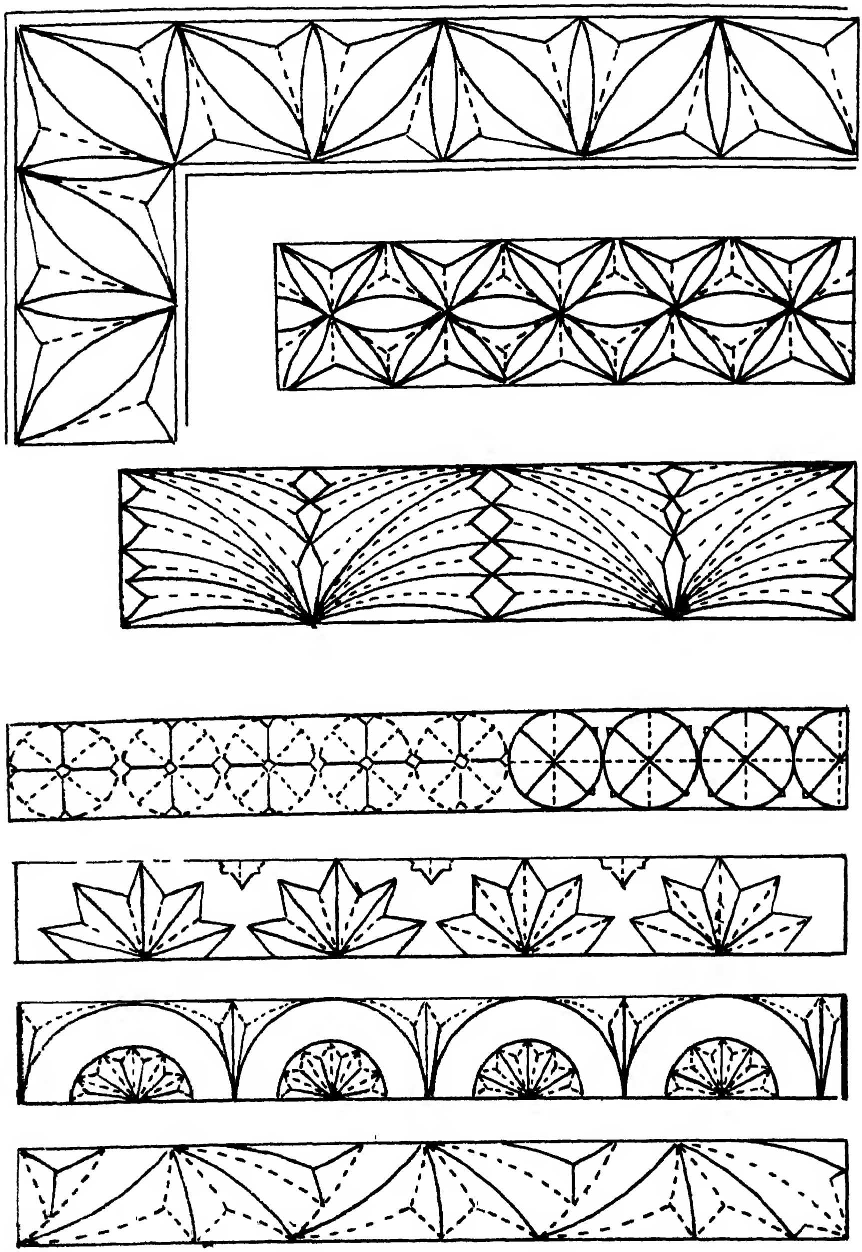


Fig. 17—Designs for Chip Carving

HOW TO MAKE A HALF-MODEL SAIL BOAT

In the eighteenth and nineteenth centuries, before the advent of nava architecture as a profession, shipbuilders made a solid model of the hu they intended to build before they started the actual construction of a boa These models were studied and modified until they satisfied the designe The lines were then taken off and enlarged and laid down to guide th shipwrights in the building of the actual vessel. Beyond a few freehan sketches necessary to illustrate certain details of construction, very few draw ings were used.

To-day, ships are designed on the drawing board and conform to certai rules, formulas and other data, which are the accumulated knowledge of th last few decades. From these drawings half-models are then constructed t help visualise the actual boat and to give the designer an opportunity t

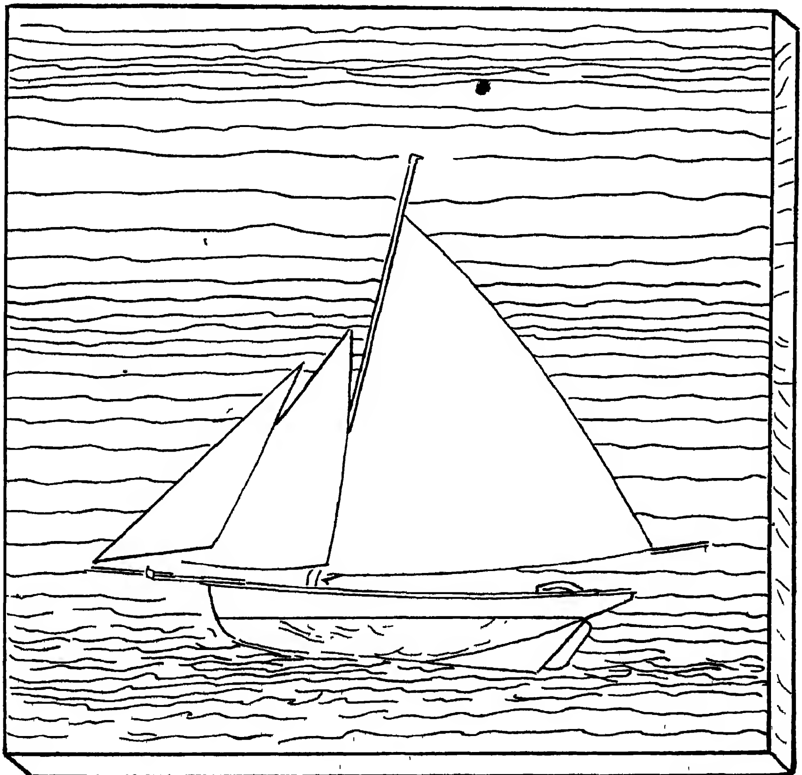


Fig. 18—The West Indies Sloop

*

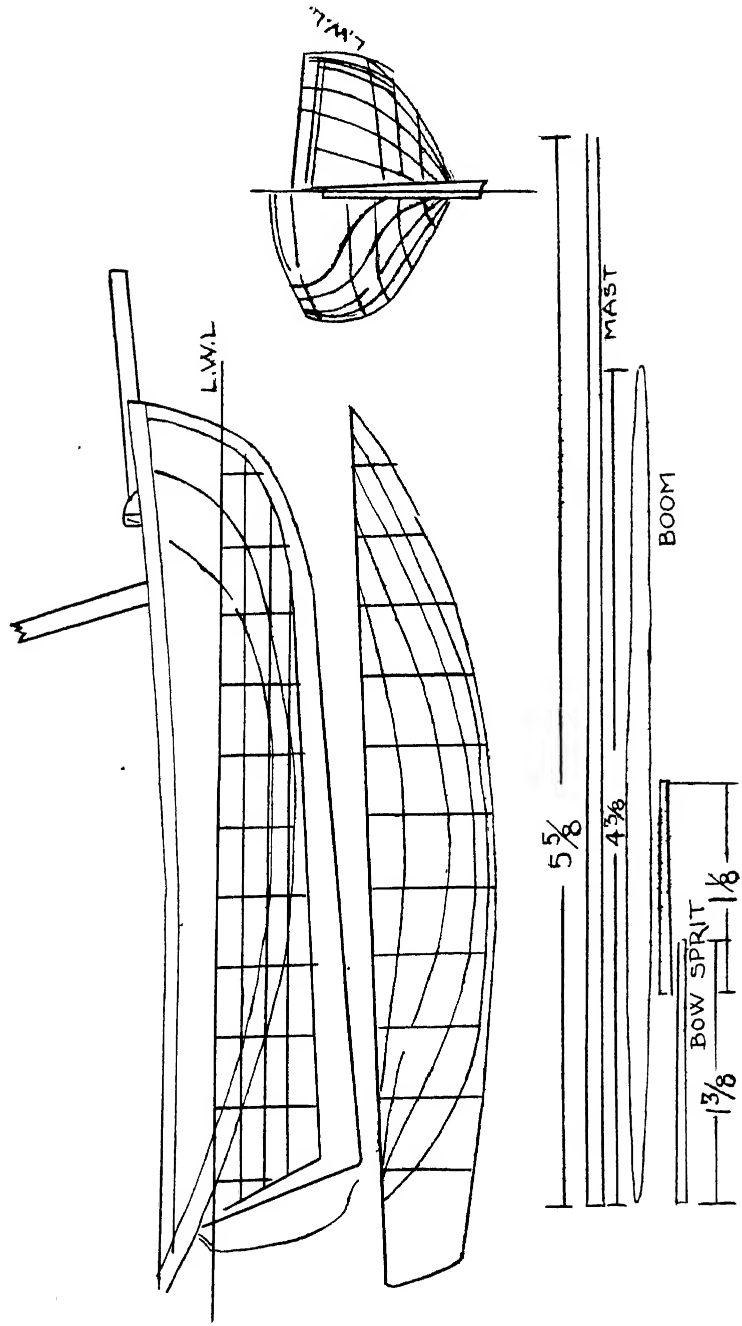


Fig. 19—Hull

check his plans and make any changes necessary Full-models are often made and tested in tanks to give the designers some idea of how a particular hull will act at various speeds, angles of keel, trim, etc.

The construction of a half-model is an excellent introduction to the art of boat model building. The beginner receives practice in reading ships' lines and shaping hulls, without the ofttimes tedious and difficult problems of making both sides symmetrical and then hollowing out the hull. Half-models, when well made, are quite decorative and can be mounted on a plaque with sails added. (Fig. 18.)

Very few tools are needed in the construction of a half-model. Most models can be made with the following: two "C" clamps, coping saw, knife, gouge, chisel, oil stone and fine and medium sandpapers. Complicated models with much detail require additional carving tools, such as files, a small plane, a pin vise and small drills.

Beginners will find sugar pine, bass and poplar, or any straight-grained soft wood easiest to manipulate. However, it must be pointed out that the chief difficulty with the soft woods is in keeping the edges sharp and the thin sections from splitting. Also, most soft woods have a pronounced grain that must be filled and painted in order to appear properly finished. The best looking models are made from hard tropical woods and are finished "natural" with linseed oil or wax. The hard woods most often used are king ebony (black), amaranth (red), padouk (scarlet turning to dark red), holly (very white, for sails), boxwood (ivory white), and pearwood (light tan, for spars and trim). All of these woods are hard and, except for the amaranth and padouk, are close-grained. If hard woods are used, the tools will have to be of the best quality and kept sharp. For detail shaping of some of the hardest woods, such as king ebony, a file is quicker than a knife.

The Hull

First determine the size of your particular model (Fig. 19) and then square up two pieces of wood which, when glued together, will make a block large enough to form the hull. Use a waterproof resin glue to which has been added a little India ink or lamp black. This will produce a thin black line where the waterline is to be and make it easier to register the templates and plan, as well as enhance the finished appearance of the hull.

If the model is to have a "natural" finish, woods of different colours are glued together, such, for example, as boxwood topsides with padouk bottom, or some other pleasing combinations. The underwater part of the hull is

usually red or green, as these are the most common colours of the copper anti-fouling paints used on real boats. Sometimes a thin piece of wood of a third colour is glued in at the waterline for contrast. Clamp the blocks together and, while the glue is setting, proceed with the plans and templates.

The Plans and Templates

Draw the deck plan and profile on thin paper, mark the station lines and then cut the plans out carefully. Make the templates on oak tag or some other thin but stiff cardboard. Three templates are usually enough for small four-to-six-inch models, one for the midsection and one about half way toward each end.

When the glue has set in the hull block, plane one hide flat, decide upon which direction you want the finished boat to head, and paste the profile plan on the block heading in the opposite direction. (This flat side is going to be the back of the hull.) American models are usually made "going" to the left, and European models to the right. Be careful to have the waterline on the plan in register with the waterline on the block. Cut around the profile with a coping saw and then file and sandpaper all the edges square with the back. Paste the deck plan on what is to be the deck and screw the the block from the back to a piece of scrap wood. This scrap of wood will act as a temporary handle that can be clamped to the table or held in a vise while working on the hull. Be sure that the screws are placed so that they will not come through the hull when you shape it.

Start at the widest portion of the hull and, using the chisel, gouge, and a sheet of No. 1/2 sandpaper, shape the hull until the template for that station fits perfectly. Then, working forward and aft, fit the other templates at their proper stations.

Take care to keep the edge of the deck (sheer line) sharp. If the sandpaper is wrapped around a small flat piece of wood and used as a file, there is less danger of rounding the corners when sanding down the high spots. The sandpaper can be wrapped around small cylindrical objects, such as pencils, dowels, etc., for sanding concave surfaces.

After the hull has been properly shaped, finish all surfaces with No. 6 or 8/0 sandpaper.

The shaping of the hull is now finished. Examine it closely. Hold it up to the light and rotate it slowly, studying the lights and shadows on the hull as it is turned. Is it smooth? Are there any irregular shadows denoting hollow spots? Are all the "lines" smooth and flowing? All these points are

important. A correctly designed ship's hull is one of man's most beautiful creations.

Sometimes beginners are so anxious to get the model finished "to see how it is going to look," that they slight the work on the hull, with the result that the hull looks more like a brick barge rather than a graceful sailing craft.

The Sails

Use straight-grained wood, five-eighths to three-quarters of an inch thick, such as white pine, bass or holly. Trace a careful paper pattern of each sail. (Fig. 20.) Decide in which direction the sails are to face in relation to the hull and then place the patterns on the wood in the right direction, both in relation to the hull and the grain of the wood. Trace around the patterns on the wood.

Use the coping saw to saw along the luff and leach of the sail, leaving the foot attached to the original piece of wood as a temporary handle.

Study photographs of sail boats in action. Notice how the sails curve in the wind, how the leach is a long, smooth curve, how the boom stretches out over the water, and how the luff and foot are held flat by the spars.

Clamp the board to the edge of the table so that what is to be the sail projects over your lap. Shape this upper (lee) surface to look as much as possible like a canvas sail full of wind. This shaping can be done with a number of tools—broad chisel, small plane, file, and pocket knife or coarse sandpaper. When the sail is shaped to your satisfaction, sand it smooth with fine sandpaper, taking care not to round the edges.

After the top surface has been shaped and smoothed down, turn the board over and hollow out the back of the sail, leaving it about one-half inch thick in the centre at the luff and thinned down to about one-sixteenth of an inch thick at the head, leach and foot. This hollowing out is done with a one-half inch gouge and the head and leach finished before the foot of the sail is carved out. (Fig. 21.) If the foot is carved first, the sail may break away from the "handle" before you are finished with it. It is not necessary to sandpaper the back of the sail as it will not show, and the ridges left by the gouge help stiffen the sail. Cut the sail loose from the "handle" and finish off the foot.

Now place the paper pattern back on the sail, matching the luff of the pattern to the luff of the sail. The pattern is then curved around the sail and will appear to have shrunk owing to the curvature of the sail. Trim off the surplus from the foot and leach and carefully sandpaper the edges

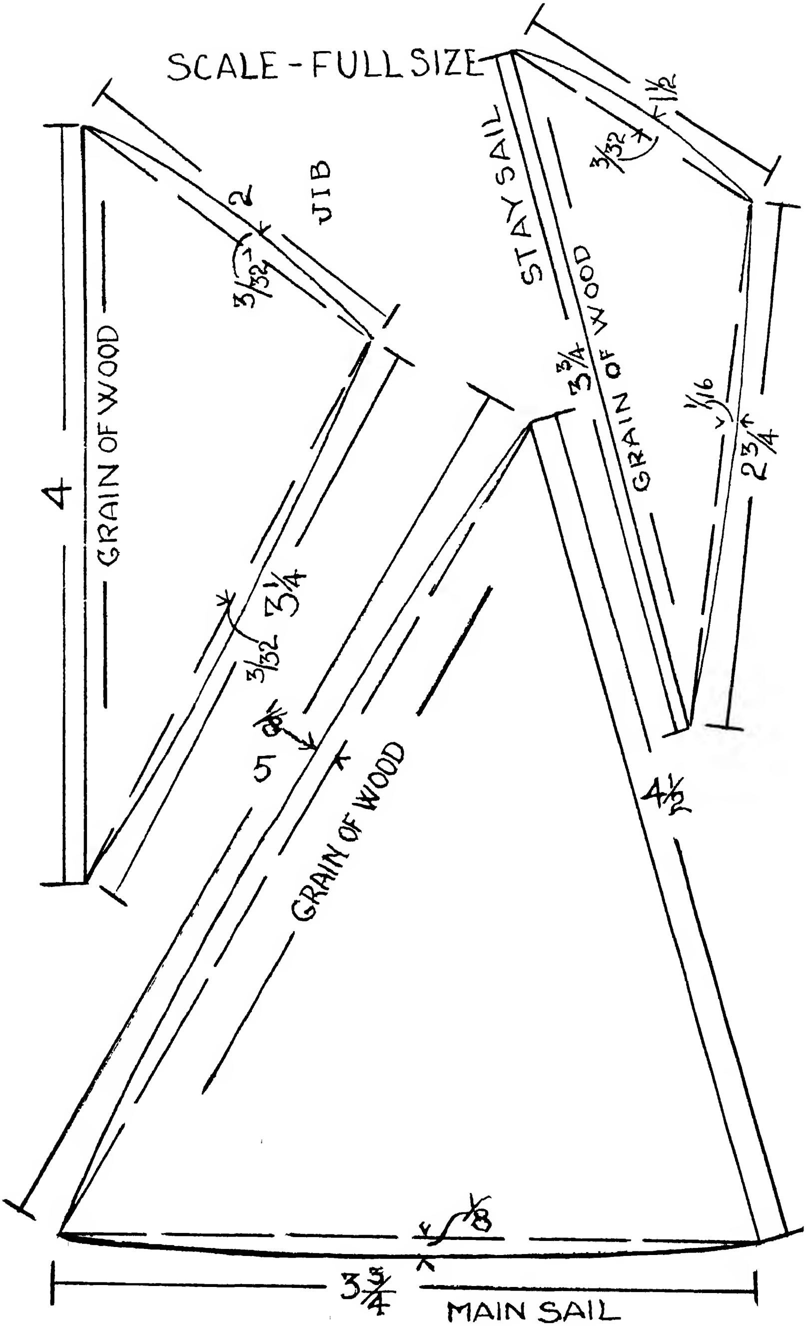

SCALE - FULL SIZE
JIB
STAY SAIL
GRAIN OF WOOD
GRAIN OF WOOD
GRAIN OF WOOD
MAIN SAIL
4
2
3/32
3 1/4
3/32
5
1 1/2
3/32
3/4
1/16
2 3/4
4 1/2
3 3/4
1/8

Fig. 20—Sails

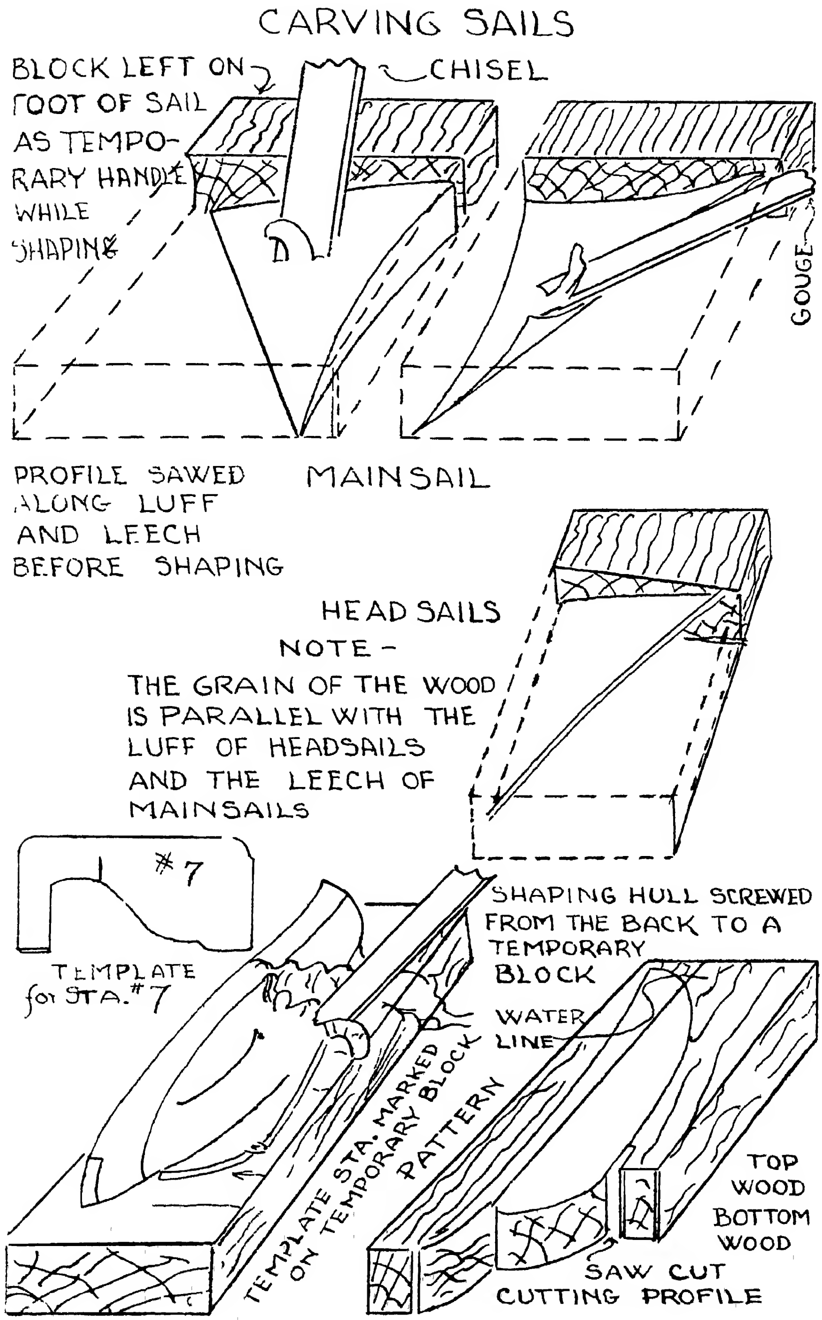

CARVING SAILS
BLOCK LEFT ON FOOT OF SAIL AS TEMPORARY HANDLE WHILE SHAPING
CHISEL
GOUGE
PROFILE SAWED ALONG LUFF AND LEECH BEFORE SHAPING
MAINSAIL
HEAD SAILS
NOTE -
THE GRAIN OF THE WOOD IS PARALLEL WITH THE LUFF OF HEADSAILS AND THE LEECH OF MAINSAILS
#7
TEMPLATE for STA. #7
SHAPING HULL SCREWED FROM THE BACK TO A TEMPORARY BLOCK
WATER LINE
TEMPLATE STA. MARKED ON TEMPORARY BLOCK
PATTERN
TOP WOOD
BOTTOM WOOD
SAW CUT CUTTING PROFILE

Fig. 21

thin from the inside. Remember, this is wood being made to look like cloth.

The other sails are made in the same way except that the curves vary according to the way the sails are rigged, either lashed to spars or stays.

The Spars

Spars are made of any straight-grained wood. Split slivers from a piece of wood until you get one long and straight enough to make a spar. Place the sliver on the table with one end projecting over the edge. Hold the sliver by this end and plane it round on the table. When it is nearly down to the desired diameter, sandpaper it smooth, round, and to the right size. Notice that spars always taper toward one or both ends, depending upon what they are to be used for. Half-round spars are easier to make if they are made round and of the right size first and then have half their thickness planed away.

The Plaque

The plaque is made of any thin piece of wood and may be left "natural" or painted. If it is going to be left "natural," care should be taken to select wood with a pleasing grain and in contrast with the model, but not conspicuous enough to detract from the model. Pine plywood is usually used for the painted plaques and the more exotic woods for "natural" finish plaques.

One-quarter inch boards of Macassar ebony (tan, brown and black streaks), English harewood (grey satin), rosewood (reddish brown streaks), or mahogany or walnut all make good backgrounds.

The Finish

The "natural" finish hulls are coated with boiled linseed oil or furniture wax, which is allowed to soak in for a few hours and then polished with a dry cloth. The sails are usually left dry as oil or wax will collect dust and stain the wood.

If holly or basswood is used for the sails, it may have bluish streaks running through it. These can be bleached out with a solution of two to four per cent oxalic acid in water, and sanded smooth again after they have dried.

The painted models are coated with enamels in the desired colours. The quick-drying synthetic resin enamels are best for this work. After the first coat is thoroughly dry, it is rubbed smooth with 2/0 sandpaper and coated

again. The second sanding is done with 4/0 paper. One more final coat is added and, when dry, rubbed with rotten-stone and water.

If to begin with the work was smooth and the enamel is allowed to dry in a dustless place, this should give a very smooth egg-shell finish. However, if the above conditions were not present, sandpaper the surface with 8/0 paper and add one more coat of enamel and finish again with the rotten-stone.

In damp weather the enamel may require a week before it is dry enough for sanding. As a rule, it is not necessary to wait longer than twenty-four or forty-eight hours, though the last coat should always be allowed to stand for two or three days before finishing.

The hull, sails and spars are mounted on the plaque with cellulose cement (model airplane cement), great care being taken to keep everything square and properly aligned.

Sailing models are usually placed off centre in the direction of the stern of the boat. If the model is mounted in the centre of the plaque, the sails create the optical illusion that the boat is running out of the picture.

Metal Work for Beginners

METALLURGY IS A fascinating subject, and it is tempting, even in a chapter such as this on simple, practical metal work, to dwell on the properties and characteristics of the various metals and of man's occupation with them since antiquity. The old alchemists had the dream of transmuting base metals into gold. The metallurgists of the past few decades have not quite succeeded in doing this, but they have accomplished wonders—making available many new metals and alloys, and making possible processes and techniques that would have appeared miraculous to the ancients.

For the purpose of the craftsman, there are about twelve metals and alloys available in most cities, and a number of others which can be purchased direct from manufacturers. The following are those most commonly used in metalry. It is necessary to know the category of each metal, for they must be handled according to their respective natures

F.—Ferrous N.F.—Non-Ferrous A.—Alloy E.—Element

N.F.E.—Copper	N.F.A. —Sterling Silver
N.F.A.—Red Brass	F.N.F.E.—Tin Plate
N.F.A.—Yellow Brass	N.F.E. —Lead
N.F.A.—Nickel Silver	F.~~E.~~A. —Cold Rolled Steel
N.F.A.—Pewter	F.E. —Malleable Iron
N.F.E.—Aluminum	F.~~E.~~A. —Carbon Tool Steel

All of these metals have certain characteristics in common and others peculiar to each.

Among the common characteristics are "grain," in extruded and rolled metals, reaction to heating and chilling of ferrous and non-ferrous metals. and the oxidation of metals in air.

Metals that have been rolled into sheets or extruded, as it is called, into various shapes, such as rods, tubing, etc., have a definite grain. This is not a natural grain, such as found in wood, but is produced by the rolling or extension of the metal. Because of this grain, metals bend and break more easily in one direction than in another. The grain of metal can usually be

determined by the appearance of the surface, or else a sample can be sent in two directions at right angles to each other, to determine in which direction it bends more easily. In original stock the grain is usually parallel to the long edge. This matter of grain is important in projects requiring sharp bends; for instance, in making a box where the bottom and four sides are all in one piece, it is customary to cut the blank shape diagonally from the metal so that the grain is not parallel to the fold of any two sides.

Another common characteristic of metals is that of oxidation. Some metals oxidise more quickly than others. They all oxidise to some extent upon exposure to air, and more rapidly in the presence of moisture, heat, and certain gases. This process of oxidation has several different names, depending upon the metal referred to, as iron *rusting,* silver *tarnishing,* copper *corroding,* etc. However, the process and its prevention are the same in most cases. We can plate a metal that oxidises rapidly with a layer of more slowly oxidising metal, such as a plate of nickel on copper, and of tin or zinc on steel, or we can cover the metal with an enamel, either vitreous like our bath tubs, or cellulose or resinous like the finish on our automobiles. These methods disguise or alter the appearance of the base metals. In metalry the craftsman usually designs his work so that the natural colours of the metal chosen are revealed in the finished product. He prevents oxidation by coating his work with a thin, transparent layer of some substance that will not alter the appearance of his work, and that will protect it from the various oxidising gases.

The removal and control of surface oxidation is a problem of paramount importance in many metal-working processes.

It is necessary to know whether a metal is ferrous or non-ferrous, elemental or an alloy, in order to know how to heat treat it. The ferrous metals are those containing iron, the non-ferrous those without iron. Irons and steels, such as malleable iron, cast iron, carbon, hi-speed and stainless steels are ferrous. Copper, tin, silver, brass, and gold are non-ferrous. An elemental metal, broadly speaking, has the same composition throughout, and is made up entirely of one element, such as iron, lead, tin, copper, etc. Alloys are solid solutions of two or more metals. This means that in their manufacture elemental metals have been melted and poured together in certain proportions and the mixture allowed to solidify. A list of alloys would include hi-speed steels (iron, tungsten, cobalt), stainless steels (iron, nickel, chromium), brass (copper, zinc), nickel silver (copper, nickel, zinc), pewter, solder, etc. The alloys used in industry and craft work far outnumber the elemental metals used.

Ferrous metals harden when suddenly cooled from red heat. Non-ferrous metals cannot be hardened by sudden cooling. Alloys of non-ferrous metals harden slightly. Metals can be softened (annealed) by heating to a red heat and then allowing them to cool slowly. Non-ferrous elemental metals can be cooled rapidly, if necessary, without hardening.

A practical illustration of these statements can be given as follows:

If you have a piece of soft carbon tool steel (ferrous-metal) and desire to make a burnisher out of it, forge and file it to shape, polish it, heat it to a cherry red and quench it in water. The steel will then be very hard and brittle. It will have to be partially annealed to remove the internal stresses caused by the sudden cooling before it can be used. If the original piece of metal is hard, like an old file, for example, it will be necessary to anneal it before forging or filing it. This is done by heating the steel to a red heat and cooling it slowly.

If you make a hammered copper bracelet (non-ferrous), you will find that the hammering makes the bracelet quite stiff and perhaps irregular in shape. Heat the copper to a dull red and allow it to cool slowly, or, if you are in a hurry, the hot copper can be cooled in water or a pickling solution, because it is a non-ferrous metal and not an alloy.

If you make a chased pin of sterling silver and need to soften the metal for further chasing, heat the metal to a very pale flesh colour and allow it to cool slowly before pickling. Sterling silver is an alloy of silver and copper. Sudden cooling might warp the metal or cause it to crack.

The woodworker buys his wood by specifying the kind and sizes of pieces he wants and pays for it by the board foot or length. The metal worker orders his metal in the same way, that is, by size and kind, and pays for it by the ounce or pound. The difference in thickness of various sizes of metals is often a matter of only a few thousandths of an inch, so that the metal worker specifies the size of metal in area by inches and feet and the thickness by thousandths of an inch, or gauge. The gauge used in measuring sheet metal is usually the Brown & Sharpe, or the American Standard wire gauge, although there are other gauges that are sometimes used.

The following is a list of the more common gauge sizes used in metalry with their decimal equivalents and the nearest fraction of an inch:

B & S Gauge	Decimal Equivalent	Nearest Fraction
0	.3240	21/64 −
2	.2592	1/4 +
5	.1836	3/16 −
8	.1296	1/8 −
10	.1080	7/64 +
12	.0808	3/32 +
14	.0640	1/16 +
16	.0508	3/64 +
18	.0403	3/64 −
20	.0319	1/32 +
22	.0253	1/32 −
28	.0126	1/64 −
30	.0100	
32	.0079	
34	.0063	
36	.0050	
49	.0010	

Eighteen-gauge is the most popular thickness for bracelets, rings, bowls, ash trays, etc. The heavier gauges are usually used only for wire, and the lighter gauges (20, 22, 24) for pins and chasing. Twenty-eight gauge is used for bezels to hold stones on jewelry, and the 32-to-34 gauge for repoussé.

Blank shapes can be bought from craft supply houses cut to size for bracelets, bowls, etc., at a cost slightly higher than the base price of the metals. Unless a very limited amount of work is to be done, it is more advantageous for the craftsman to buy the metal in larger pieces and do his own cutting. In this way various shaped blanks can be dovetailed together, reducing the scrap to a minimum. What little scrap is left over can be used for jewelry, test pieces, and incidental accessories to other projects, such as cigarette rests, handles, feet, etc.

TOOLS

The tools necessary for metal work and jewelry are not very costly. Many of them can be improvised at home with a little ingenuity. Some of the special tools, such as the surface gauge or circle cutter, are not really needed unless a great deal of work of the same kind is contemplated. Jewelry

requires even less equipment than does general metal craft. In fact, a fairly complete personal jewelry kit can be carried in an ordinary shoe box.

There is, however, certain fundamental equipment that is necessary if any serious work is to be done. A prime requisite is heat. A one- or two-burner gas stove is ideal for annealing and pickling. Another requisite is a blow torch for each two jewelry workers. The blow torch requires a supply of compressed air. This means a compressor of some kind, and a motor. Foot blowers and mouth blowers are not very satisfactory, particularly for beginners. A regular blower or compressor is advisable, although a vacuum cleaner, with a cork and air hose substituted for the dust bag, can be used.

Following is a minimum list of tools and supplies for light craft work. With these you will be able to make the articles described below. At the end of this chapter will be found a more complete list of metalry equipment, sufficient for a shop or a school.

Tools For Projects Described Here: Ballpein hammer (8-ounce); rawhide mallet (2-inch face); doming mallet (2-inch face); anvil (10 lbs. or larger polished face); bench vise (clamp on) (3×4 inches); file (8-inch hand, second cut); assorted chasing tools; soldering iron; pickling and annealing stove; glass tray, 8×10 inches; stone crock, 3 gallons; metal shears, 3-inch blade, straight; metal shears, 2-inch blade, curved; dividers, 6-inch; scale, $12 \times 1/32$ inches, flexible; scriber; soft solder, half-and-half; flux, for soft solder; sheet metals, 18-20-22-28 gauge (B & S); sulphuric acid; nitric acid; potassium sulphide (small fused lumps); jeweler's clear lacquer; lacquer, thinner; jeweler's rouge; jeweler's tripoli; asphaltum varnish; turpentine; muslin buff; flannel buff.

TECHNIQUES

Construction of Copper Bracelet

Blank. 18 gauge (B & S) copper, 5½″ in length; width optional.

Annealing: Heat the metal to a dull red on a gas stove or by means of a blow torch. Allow the metal to cool. *Note:* This being a non-ferrous elemental metal, it can be cooled rapidly by quenching in water or pickle, if necessary. The copper is now dead soft, but discoloured by a coat of copper oxide. The next step is to clean it in a pickling solution.

Pickling: Make up a pickling solution in a glass or stone-ware crock. This solution is 4% to 10% solution of sulphuric acid in water. The exact propor-

tion is not important, although too strong a solution can be dangerous if it is spattered around, while too weak a solution takes a long time to clean the metals. *Caution:* The water should be at room temperature or colder and the *acid poured slowly into the water. Never add water to concentrated sulphuric acid.* If kept covered, the pickling solution will keep until the acid content is exhausted. It does not deteriorate with age. The work is immersed and left in the pickle until it is bright.

Use copper tongs or wire to remove the work from the pickle. Rinse the work thoroughly with water and wipe it dry.

Flattening: The blank is probably somewhat warped from the annealing and handling, so that the next step is to hammer it flat on some smooth, hard surface such as an anvil or old flat-iron. In order to avoid the hammer marks that a hard steel hammer would make, we do the flattening with a relatively soft mallet of paper, leather or wood.

Designing: Our first bracelet is going to be decorated with line chasing and spotting.

Select a design that can be made with single outlines. Leaves or flowers are good subjects, as are also many of the Indian designs.

When you have selected a design, sketch it directly on the black with a soft pencil.

If you have difficulty in drawing freehand, the design may be traced on paper and transferred to the metal by one of the following methods:

Transferring Design: Polish the metal with 3/0 steel wool or very fine emery paper (6/0 to 8/0). The polishing is done by rubbing the abrasive back and forth in one direction only—never crisscross or round about. After the metal has been polished, ordinary typewriter carbon paper can be used to transfer the design from the original sketch. The resulting outline on the metal may be rather faint in places, but can be touched up with a soft pencil.

The other method of transferring a design involves a little more work but leaves a much more definite outline on the metal.

Polish the metal as was recommended in the first method and then warm the metal over a clean flame. Rub the metal with a cake of beeswax and reheat the metal until the wax flows in a thin film all over the surface.

Trace the design on thin paper and then cover the back of the paper with pencil lines over an area slightly larger than the design, or trace the design again on the back of the paper.

The sketch is then carefully oriented on the cooled waxed metal and the design gone over on the original lines with a medium or hard pencil.

The wax will pick up enough of the graphite from the back of the paper to show a distinct outline on the dull wax surface. This outline can be scratched permanently into the surface of the metal with a scriber and the wax remelted and wiped off. It is not always necessary to scratch the design into the metal. Where the work is to be line chased, the chasing can be done through the wax and the wax melted off later.

Our bracelet is going to be line chased.

Line Chasing. Line chasing is the term given to designs in metal made by marking the metal with various shaped blunt chisels. These lines can be straight or curved, or consist of a number of other patterns, such as stippling, cross hatching, shading, etc.

These blunt chisels are called chasing tools and there are literally hundreds of different sizes and shapes used by professional chasers. The beginner can do quite creditable work with only six or eight tools and can make or acquire others as the need arises.

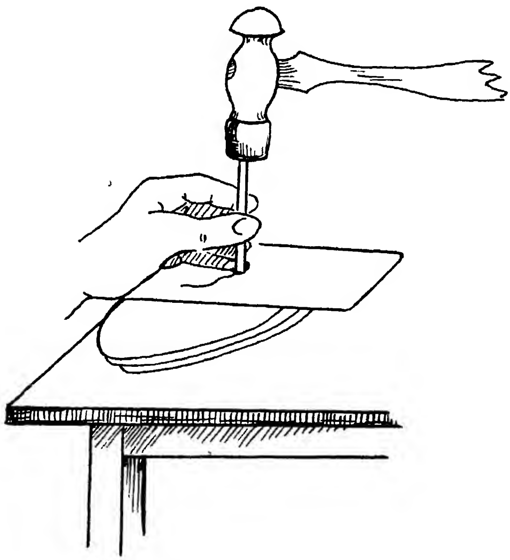


Fig. 1—Line Chasing

Place the work on an anvil or some other smooth, metallic surface. Use a straight line chaser. Hold it nearly vertical, leaning slightly away from the direction you are going to chase the line. Bring the tool down on the metal and strike the other end of the tool one short, sharp blow. (Fig. 1.) Move the tool forward about half its width and strike again.

Practice on a piece of scrap metal before attempting to work on your bracelet. The reason for "one short, sharp blow" is that repeated indiscriminate blows of the hammer are liable to make the tool bounce on the metal and create "stutter" marks parallel to the original line but not on it. By moving the tool forward only half its width each time, the previous mark in the metal helps to guide the tool for the next mark and creates a continuous line. With practice, this process can be quite rapid, and, if the tool

is held at the right angle, it can be made to move along a fraction of an inch at each stroke of the hammer. An ordinary carpenter's or machinist's hammer can be used for this work, although the regular chasing hammer has a better "balance" and a broad face, making it easier to strike the chasing tool evenly each time. The chasing hammer looks something like a shoemaker's hammer. The chasers most often used are the 3/8″, 1/4″, and 1/8″ straight and curved liners.

After the design has been line chased, the background can be left plain or be spotted—decorated with hammer marks.

Spotting. Spotting is giving a hammered effect to the surface of the metal. This technique is often called planishing, although the word planishing should be reserved for the hardening, stretching or compressing of metal, which can be done with or without showing hammer marks.

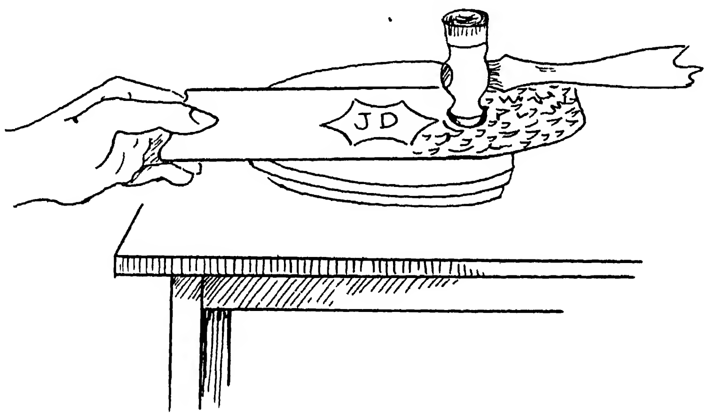


Fig. 2—Spotting With Ball Pein Hammer

Place the bracelet blank back on the smooth, metallic surface and strike the background areas with a round, polished face hammer. (Fig. 2.) The usual hammers used for this work are the spotting, planishing or silversmith's hammers, all of which have highly polished faces. An ordinary machinist's ballpein hammer may be used if the ball face is kept smooth and polished and never used for anything else.

Hold the hammer by its handle well away from the head. The elbow of the operator should be the same height from the floor as the surface of the metal being spotted. Keep your elbow close to your side and the forearms fairly stiff, with the wrist loose. Strike uniform, rhythmic blows, with wrist motions only, moving either the whole body or the work between the blows

of the hammer. Do not try to aim each individual blow of the hammer, but allow the pattern of the hammer marks to be more or less accidental. Practice on a piece of scrap first.

After the metal has been spotted it will be found to be much harder than it was and spread a little in both directions, with irregular edges. The blank can be retrimmed back to its original size or left as is. A pleasing effect can be had by trimming the bracelet to the correct length and leaving the sides irregular. The irregular edges caused by hand-spotting are never found on machine-made jewelry.

The blank can now be formed into a bracelet and then finished, or the finishing can be done while the metal is still flat.

In either case, the bracelet is formed in the same manner.

Forming Bracelet There are two things to remember in forming this type of bracelet. One is that we do not want to make any additional hammer marks, and the other is that wrists are seldom round. They are usually oval in shape.

The tools necessary to form the bracelet are a mandrel on which to shape the bracelet, and a soft mallet of rawhide or paper.

The mandrel can be a large dowel stick, or a piece of pipe with a diameter approximately the same as the thickness of the wrist. The small end of a baseball bat is ideal.

Hold the brace in the left hand with about one-quarter of its length projecting over the mandrel. Use the mallet to beat this end down and around the mandrel. (Fig. 3.) Turn the bracelet end for end and repeat this operation on the other end.

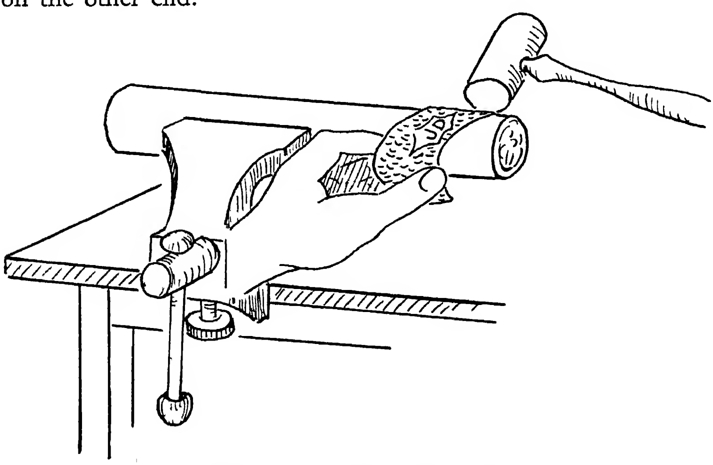


Fig. 3—Forming Bracelet

The bracelet should now be slightly flat in the middle and curved in at each end with a gap between the ends to slide the wrist through. There may be a slight manual adjustment necessary to get the bracelet to the right size, and, if you have a very small wrist, it may be necessary to cut off a little from each end to make the gap large enough to slip over the wrist. The ends and corners should be carefully rounded and smoothed to prevent scratching the wrist when putting the bracelet on or taking it off.

Finishing Copper or Silver. There are a number of ways of finishing copper or silver. Brass, nickel silver, pewter and the other metals are more limited as to the finishes they can be given.

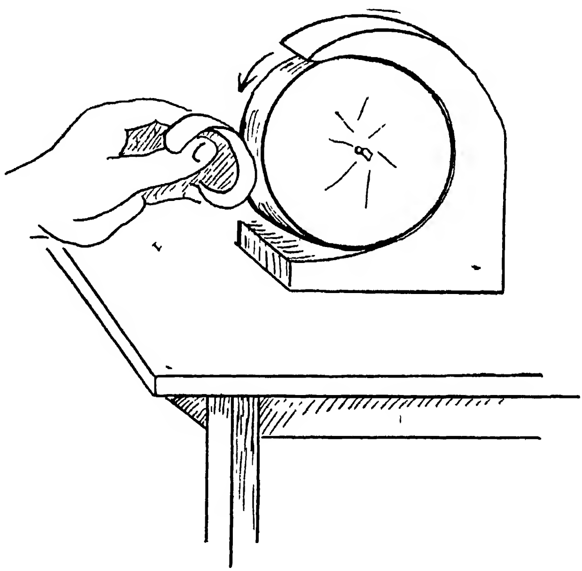


Fig. 4—Using Polishing Wheel

Bright: The metal can be given a bright finish. This means a high polish on a buffing wheel. Use a stitched muslin wheel with tripoli. Start the polishing motor, touch the wheel with the tripoli stick for a moment and then press the metal against the wheel until a high polish is attained, replenishing the tripoli on the wheel from time to time. (Fig. 4.) *Caution.* The wheel should revolve at a high speed—about 2000 R.P.M.—toward you. The polishing is done below the centre of the wheel. Always polish from the centre of the work toward the lower edge. Never allow the wheel to touch the upper edge of the work, as it is liable to strike the work from your

hands and throw it down on the table or floor with great force. Small pieces can be attached temporarily to a scrap of wood for polishing.

After the work is highly polished, it is thoroughly washed with soap and water to remove any trace of tripoli. The muslin wheel is then changed for a flannel wheel, and a jeweler's rouge stick substituted for the tripoli. The final polishing is done in the same way and gives a very high luster.

After the rouge polishing, wash again with soap and water.

Tripoli is a mild abrasive and will remove scratches, round the edges, etc. The rouge will not remove scratches from the work, but merely gives the final luster.

It is always very important to wash your work after polishing it on the tripoli wheel. If any of the tripoli is carried over on to the rouge wheel, you cannot get a high luster from the rouge polish.

Bright Dip: The bright dip finish is popular commercially. It consists in washing the work thoroughly with strong alkaline and then dipping it for a moment in diluted nitric acid. This imparts a brilliant crystalline effect to the metal. *Caution·* Do not get any acid on your skin or your clothing. If you do, however, immediately flush with water and a solution of washing soda.

Satin. The satin or scratch brush finish often seen on silver is done by polishing the metal wtih a wire brush wheel instead of the buffs mentioned in polishing. *Caution.* When using a scratch brush wheel, always wear goggles, because sometimes the wire bristles fly out of the wheel. The home craftsman can imitate the professional scratch finish with 3/0 steel wool or a stiff brush and pumice powder and water. Always rub the metal back and forth in one direction only.

Oxidised: The most popular finish with the home craftsman is the oxidised finish. This might also be called the inevitable finish, since all of these metals oxidise in time. If you hasten the process by doing the oxidising yourself, you can also control the process and bring out highlights and shadows.

A warm or hot solution of liver of sulphur (potassium sulphide) is used. A piece about the size of a lima bean in a half pint of water is sufficient. In the case of copper, the solution is applied to the work with a small 3/0 steel wool.

Lacquering: As we mentioned earlier in this article, all metals oxidise. This statement even applies to articles that we have oxidised, since we only partially oxidised them. If left alone with the surface unprotected, they would darken even further.

It is therefore necessary, regardless of the finish we have selected, to coat

the surface of the meal with a film of some substance that will protect it from the air.

The professional jewelers use a clear, thin lacquer that is sprayed onto the work and dries, forming a very thin film of celluloid over the surface.

A substitute that is almost the same is clear nail polish thinned with nail polish remover and brushed rapidly over the work with a soft brush. Other methods of protecting the surface of the metal include coating the metal with thin white shellac, spar varnish, or furniture wax.

The techniques described so far can be employed in making many other things besides bracelets. Try using these same techniques in making letter openers, pins, watch fobs, identification tags, blotter corners, picture frames, etc.

CONSTRUCTION OF A SIMPLE BOWL

For our second basic technique project we have selected a copper bowl.

We will need a piece of 18 gauge (B & S) copper, 6″ or 8″ in diameter. The tyro had better practise on the smaller size first.

If the metal is in a large sheet or roll, cut a square piece slightly larger than the disc required—about 1/8″ or so. Draw diagonal lines lightly from corner to corner with a pencil. This will indicate the centre. Use a pair of dividers as a compass and scribe a circle of the diameter you have selected. Cut off the corners just outside this circle with the straight shears, and then cut around the circle the same way you would cut a paper circle with ordinary scissors. (Fig. 5.) If you have a pair of curved shears, the circle will be a little easier to cut. Use them with the concave side out. Sometimes in cutting heavy metals it is advantageous to place one handle of the shears in a low vise and then exert all your pressure on the upper, moving handle.

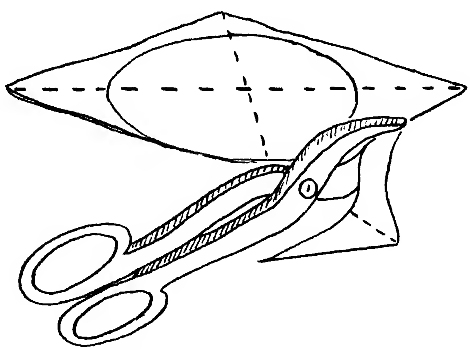


Fig. 5—Cutting Circle

As soon as the disc has been cut, take a second cut or smooth file and remove the wire edge caused by the shears.

Anneal and pickle the disc and wipe it dry.

Doming Equipment: The bowl can be formed by hammering it down into a hard wood mould. These can be bought commercially and come in a variety of sizes and shapes. Very little skill is required in their use. Their chief disadvantage is that the craftsman is limited to the shape of the mould he is using, which does not allow much room for personal initiative in design or shape of the finished bowl.

A less expensive method that requires a little more skill but allows great latitude in the choice of size and shape, is the use of a forming block. This second method requires two to four tools, all of which can be homemade.

A Forming Block. This consists of a piece of hard wood, preferably maple, about 2″ × 4″ × 8″ in size. In the middle of one side is carved a hemispherical depression about 3″ in diameter and about ½″ to ¾″ deep in the centre. This other side of the block has a similar depression, 2″ in diameter and ½″ deep, for smaller bowls, pins, brooches, etc. This is called a forming block.

A Doming Mallet. This is a hard wood mallet with one flat face and one half-round face. It should have a head about 2″ in diameter and 4″ long.

A Bottoming Stake: This can be of metal or hard wood and should have a round flat end at least 2″ in diameter. The length is immaterial. This stake is used for flattening the bottom of the bowl after it has been domed.

A Gooseneck Stake. This may also be of metal or hard wood and is used inside of the bowl when hammering in an inside curve or lip. One convenient shape consists of a piece of hard wood about 2″ square and 1′ or 18″ long. One end is rounded full size, and the other planed down to about 1″ × 2″ and rounded elliptically. These ends can be shaped with a coarse file and sandpaper.

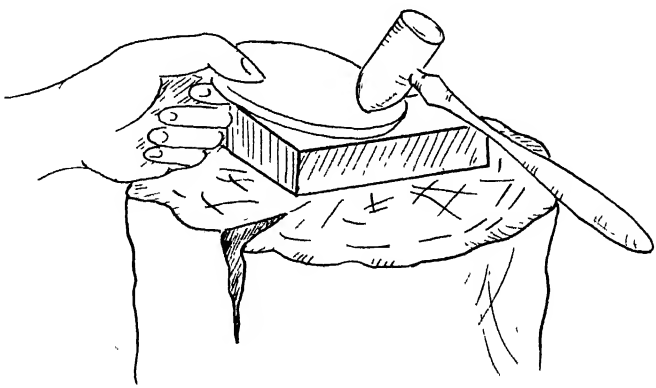


Fig. 6—Doming

Doming: Place the disc of copper flat on the doming block over the depression and extending a trifle over the edge of the depression. Aim for the centre of the depression with the round face of the doming mallet and give one firm blow with the mallet, driving the copper partly into the depression. (Fig. 6.) Rotate the disc ½″ or so and strike again. Repeat this operation, rotating the disc slightly between each blow of the mallet. When this operation has been completed all the way around, you should have a shallow tray with a slightly wrinkled edge. Move the disc or tray further over the depression and go around again inside the first row of mallet marks. Move the disc further in each time around until you end up with one blow in the centre. After this first doming, a 6″ disc should be changed into a shallow dish about 5½″ to 5¾″ in dameter and ¾″ to 1″ deep. A word of caution regarding wrinkles around the edge—never let them get so high that they fold over, because if they do, they will split the metal into radial cracks that get worse as you go along. If this should happen, trim the bowl down to a smaller size, cutting the cracks off entirely.

The bowl will be found to be quite hard from the doming. Anneal and pickle.

Wipe the bowl dry and place it back on the forming block as before, except that you no longer can hold it flat. Tip it up so that the part that is going to be struck with the mallet is completely supported all around by the depression in the forming block. Start doming at the centre edge and work around and in as you did the first time. The bowl should now be about 1½″ deep and about 5″ in diameter. If it is not, it merely means that you did not strike the metal hard enough and it will have to be domed more often.

Anneal and pickle after each doming operation. It is possible to dome two or three times between annealings, but the metal is usually so hard that not much progress is made, and it is really quicker in the end to anneal each time around.

When the bowl has reached the desired shape and size, go around three or four times with the mallet, rhythmically and lightly, without annealing. This should remove all the individual marks made in the initial doming.

If any shape other than hemispherical is desired, the same process is used as for the round bowl, and, after it has been evened up, the sides are turned in, or flared out, or straightened, by putting the bowl over a stake held in the vise and striking the bowl with the flat face of the mallet from the outside.

When the bowl is finished, the bottom is hammered flat. Find the centre

of the outside of the bowl by the trial and error method with a pencil compass. Use this centre to scribe a circle the size the base is to be. Place the bowl over the bottoming stake so that the circle coincides with the edge of the stake, and strike the bowl just inside of the circle with the round face of the mallet. Rotate the bowl slightly and repeat until the bottom has been flattened. It may be necessary to turn the bowl right side up and strike from the inside from time to time. The bottom should be slightly concave when finished, so that the bowl rests on the rim of the base.

Most bowls need their edges trimmed when they are finished. This is done by placing the bowl, right side up, on some large flat surface and scribing a line around the lip parallel with the base, starting at the lowest place or side of the bowl. The mechanic uses a surface gauge for this operation. We can use a pencil placed on a book or block of wood, whose thickness will allow the pencil to just touch the lowest part of the lip of the bowl. The bowl is then carefully rotated so that pencil line can be drawn all around it.

Use a small pair of curved shears to trim this irregular surplus off, and a file or emery cloth to remove the wire edge.

The bowl can be finished by the same methods described for bracelets.

These bowls can be decorated with line chasing and spotting if you have a metal stake that will fit the inside contour of the bowl.

The doming technique can be employed in making other items, such as sconces, pins, buckles, buttons, cups, handbag accessories, etc.

Etched Pin: The literal translation of etching means "eating away." In metal work this eating away is done with acids.

Etched work has always been popular where little equipment is available. About the only skill required is the ability to paint with a small brush.

Cut a small rectangle of any of the common non-ferrous metals except those containing aluminum. The size is optional. One and one-half by two inches is an average size. File the edges smooth and round the corners slightly. Polish both surfaces with 3/0 steel wool.

The design is then transferred to the metal by either of the methods described earlier in this chapter and then scratched into the metal with a sharp needle or scriber. The metal must now be thoroughly cleaned and washed with strong soap and hot water to remove all traces of wax, etc.

Etching: The basis of etching is to eat away part of the surface of the metal with an acid and leave the remainder of the metal intact. The control of what metal is to be eaten away and what metal is to be left untouched is done by coating the surface of the metal with some substance not affected by acid. This substance is called a resist. There are a number of resists available.

The most common one is black asphaltum varnish thinned with turpentine.

Decide whether you want to etch the design or the background. In other words, is the finished pin going to show a raised design on a sunken background, or is the design going to be sunken and the background left raised?

Carefully paint with asphaltum all the surfaces you do not want the acid to touch. Use a soft, well-pointed brush. If the pin is to have an etched background, it will be necessary to paint a border around the edge of the pin. The pin is going to be wholly immersed in the acid solution and unless the edges of the pin are protected with asphaltum, they will be eaten away and appear quite ragged and thin.

After the asphaltum on the front is dry, turn the blank over and coat the back. Make certain that all of the metal surfaces that are not to be etched are thoroughly protected with resist.

There are a number of etching solutions designed for maximum efficiency with different metals. They all involve the use of nitric acid. A basic formula is one part of concentrated nitric acid to two parts of water. The acid is poured slowly into the water and the solution kept in a covered glass dish. *Caution:* Use this solution outdoors or in a well-ventilated room and avoid getting any of the solution on the skin or clothing. Nitric acid is very corrosive. In care of accident, immediately flush with water and cover the area with washing or baking soda.

This basic formula is approximate. In warm weather it will work faster than in cold weather. The thing to watch is the gas bubbles formed as the acid works on the metal. They should be small and come to the surface slowly, appearing as a frosting on the surface of the metal. If the solution is too strong, the action will be violent. Large bubbles will form that will tear away the resist from the metal and create irregular, ragged lines in the design. The strength of the solution can be adjusted by diluting or adding acid until the right balance is attained.

Handle the work in and out of the acid with a glass rod or a rubber or wooden paddle—never with the fingers.

The length of time the work remains in the etching solution depends upon several factors—the depth of the etching desired, the strength of the solution, and the temperature of the solution. It may vary anywhere from five or ten minutes to an hour or more. Lift the work out of the solution from time to time and examine it for progress. Watch particularly the thin lines and edges. If etching is too deep, the acid may eat under the asphaltum and the thin lines will disappear altogether. For deep etching, it is necessary to dry the work, repaint the edges of the design and then etch further.

When the etching has progressed far enough, rinse the work off, wipe it dry, and remove the asphaltum with turpentine and a rag.

The pin may need a little trimming around the edges with a smooth file. Polish the pin and apply a pin back.

Regular jeweler's pin backs can be bought. They come all in one piece or separately—joint, catch, and bar. In buying, specify "for soft soldering." A substitute for this jeweler's finding is an ordinary safety pin of the right size. In either case, the finding is soft soldered to the back of the pin.

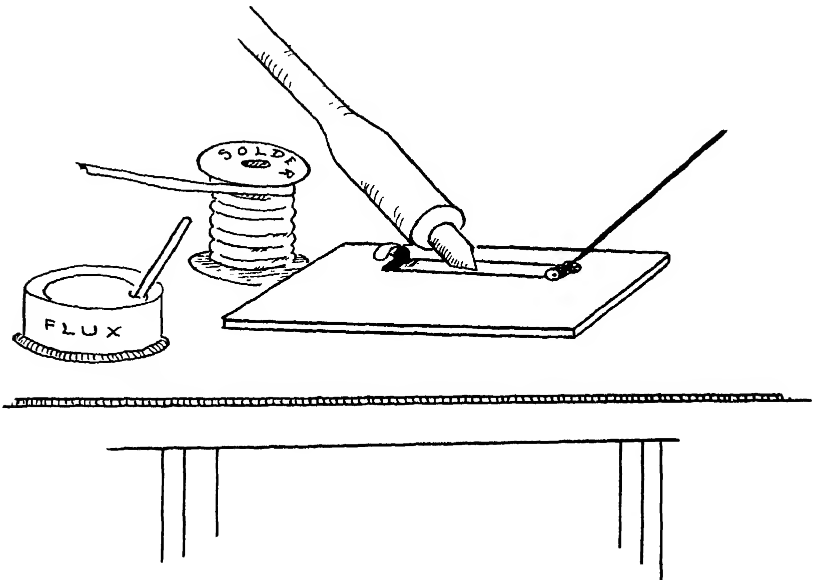


Fig. 7—Soldering Pin Back

Soft Soldering: Common soft solder is an alloy of lead and tin. It melts at about 414° F. and can be purchased on a spool like wire.

Here we come to the problem of oxidation again. Solder will not "take" to an oxidised metal. Metals that oxidise at ordinary temperatures do so much more rapidly when the metal is hot. Our problem then is to keep the metal from oxidising even while it is hot. The reagent used for this purpose is called a flux. The most common flux used in craft work is in the form of a resinous looking paste put up in two-ounce cans.

The use of an electric soldering iron of 65-watt capacity is the most convenient method of soldering, although a small soldering copper such as the plumber uses may be employed.

If the soldering iron is new, the tip is coated with a very thin layer of flux and the iron plugged into some convenient electrical outlet. When the

tip gets hot, touch it to the solder on all four sides. This is called tinning the iron. *Caution.* The iron should be disconnected when not in use as it will overheat and the tip become heavily oxidised through prolonged heating. If this does happen it may be necessary to file the tip clean and retin it.

Place the pin face down and with the top away from you on some clean, wooden or asbestos surface. Paint a thin line of flux across the back of the pin with a matchstick or some other small stick of wood. This line should be parallel to the top edge of the pin and about one-third of the width of the pin from the top. Paint a thin line of flux on the back of the jeweler's pin or on the "safety" side of the safety pin

The finding should be mounted with the catch toward the left.

Hold the pin on the line of flux with a small stick or a pair of tweezers.

Touch the soldering iron to the solder and pick up a small excess of solder on the tip of the iron.

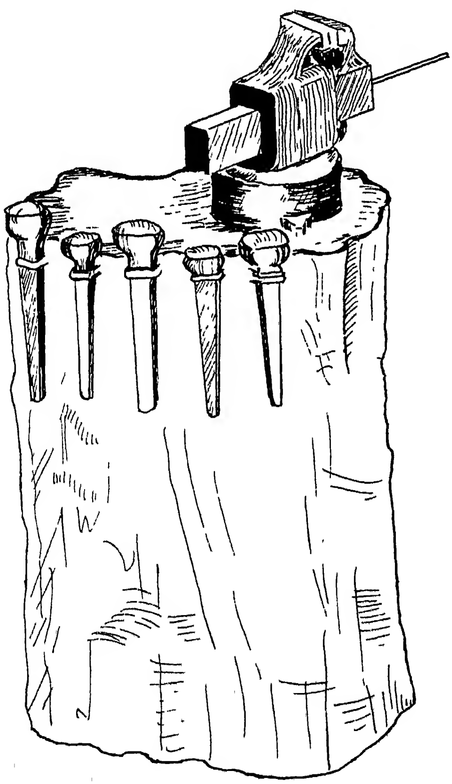


Fig. 8—Vise and Stakes Mounted on Hardwood Block

Place the iron on the work and up against the finding. Hold it there until the work and finding are hot enough to cause the solder to run off the iron and along the pin. (Fig. 7.)

As soon as this happens, remove the iron, but continue to hold the finding in place until the solder has hardened. The solder has a dull, frosty appearance when it has solidified.

Caution: If the solder does not flow on to the work, either the work was not allowed to get hot enough or was dirty to begin with. Do not try to hold the work with pliers or in a vise, or to solder on the bench block

or anvil. All of these masses of metal absorb heat and would have to be heated as hot as the pin before the solder would flow.

After the soldering has been completed, wash off the excess flux with strong soap and water.

Finish the pin by one of the methods described.

The following is a list of tools and supplies advisable for a general metalry and jewelry shop. The items marked with a single asterisk are recommended for jewelry. The double asterisk indicates tools for metalry. The items unmarked are handy to have and simplify some operations but are not absolutely necessary. Fig. 8 illustrates a vise and stakes mounted on a hardwood block.

JEWELRY AND METALRY EQUIPMENT

Hammers

**	*	Ballpein	8-ounce	**	Silversmith's	4-inch
	*	Crosspein	2-ounce	**	Silversmith's	5-inch
		Chasing	4-ounce	**	Raising	5-inch
**		Spotting	4-inch		Planishing	5-inch
	*	Silversmith's	3½-inch			

Mallets

	*	Horn	1-inch face		Rawhide	3-inch face
		Rawhide	1-inch face		Doming	1½-inch face
**	*	Rawhide	2-inch face	**	Doming	2-inch face

Anvils

	*	Bench block, steel	2″ × 4″ × 4″ or larger
**		Anvil	10 lbs. or larger (polished face)
	*	Lead block	5 lbs.

Vises

	*	Bench vise (Clamp on)	3 × 4 inches
**		Bench vise (bolt on)	4 × 6 inches
	*	Hand vise	1 × ½ inches
		Pin vise	0 to #60

Saws

	*	Jeweler's saw frame	5-inch
		Jeweler's saw frame	8-inch
**		Hack saw frame (adjustable)	
		Jeweler's piercing saw blades	#4/0
	*	Jeweler's piercing saw blades	#2/0
		Jeweler's piercing saw blades	# 1
**		Hack saw blades (18-pitch)	12-inch
		Hack saw blades (32-pitch)	12-inch

Files

	*	Needle 1 set of 12 assorted		*	8-inch smooth pillar
**	*	6-inch half round, second cut			10-inch hand, second cut
**	*	8-inch round	**	*	8-inch hand, second cut
**		8-inch, three square			10-inch, flat bastard
		8-inch, four square			

Gravers

*	Round	*	Knife	*	Flat, etc.

Pliers

**		Electrician's side cutting	8-inch
**		Slip joint gas pliers	7-inch
	*	Round nose	5-inch
	*	Half round	5-inch
		Needle nose	5-inch
	*	Chain nose	5-inch
		Ring nose, etc.	
**		End nippers	8-inch
		Diagonal nippers	6-inch

Metal Shears

	3-inch blade, straight	**	2-inch blade, curved
*	2-inch blade, straight		Jeweler's snips, curved

Metal Shears (*Continued*)

- * Dapping punches (set)
- * Dapping block
- * Chasing tools (Assorted)
- ** * Countersink, ¼-inch
- ** * Hand drill, 0-¼-inch chuck
- ** * Twist drills, ¼, 3⁄16, ⅛, 1⁄16 —#60, #70
- Pin vise
- Soldering iron
- * Asbestos soldering blocks
- ** * Soldering torch
- ** * Pickling and annealing stove
- Pyrex beaker, 1000 *cc*
- Glass tray 8 x 10 inches
- Stone crock 3 gallons
- * Draw plate (51-hole combination)
- Draw tongs
- * Ring mandrel (steel)
- ** * Dividers 6-inch
- ** * Combination square, 12-inch
- ** * Scale 12 x 1⁄32 inches, flexible
- Scriber
- * Hand vise 1 x ½ inches, open
- Burnishers, straight and curved

SUPPLIES

Solder

- ** Soft, half-and-half
- ** Flux, for soft solder
- * Hard "easy"
- * Flux, for hard solder

Concentrated Acids

- ** * Sulphuric
- Nitric
- Hydrochloric

Buffs

- ** * Muslin
- ** * Flannel
- Rivets, 1⁄16 & ⅛ × ¼ (copper, brass, aluminum, etc.)
- Sheet metals 18-20-22-28 gauge (B & S)
- Wire 12-18-22 gauge (B & S)
- Bessemer rod 1⁄16 and ⅛ inch
- Steel dressmaker's pins
- * Jeweler's findings
- Chaser's pitch
- Wire 12-18-22 gauge (B & S)
- Jeweler's clear lacquer
- Lacquer thinner
- ** * Jeweler's rouge
- ** * Jeweler's tripoli
- * Asphaltum varnish
- * Turpentine

CHAPTER XII

An Introduction to Pottery

POETIC AND SCRIPTURAL writers thousands of years ago were fond of allusions and metaphors which likened the Creator of the universe to a potter and man to the clay. These poetic idioms could be easily understood and appreciated by their audiences, for working in clay was one of the very early practices of our remote ancestors. Household needs at first directed them to utilise the most commonplace and plentiful substance at their disposal—the earth on which they trod and from which they drew their sustenance. They made their roofs waterproof with mud, and their water-pots and cooking vessels were fashioned of it and baked in the sun. On clay tablets they kept crude records, and finally, their artistic instincts having been awakened, they began to strive for beauty in form and to add ornamentation.

Like weaving, ceramics began as a homecraft, became an art, then an industry, and now again is being widely practised as a handicraft and a folk art.

One of the first evidences we have of man's pride in his work and also of the merchandising instinct, is a small Egyptian vase in the Metropolitan Museum in New York City, which bears the legend, "Jason made this, let the buyer remember."

The development of pottery coincides closely with the cultural development of man, so much so that ethnologists have often used pottery as a sort of index of culture.

The potter's wheel was in use many thousands of years before the Christian era, but the primitive method of making pottery was by the coil method. Our American Indians used this technique, and the potter's craft as practised in schools, recreation centres, and by hobbyists, is usually approached in this way.

In this chapter you will find some of the basic methods of making pottery by hand. A pottery vocabulary is given at the end.

WHAT YOU WILL NEED FOR A POTTERY WORKSHOP

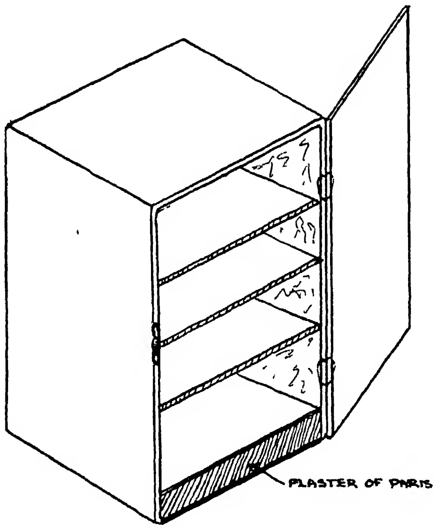


Fig. 1—Damp Box

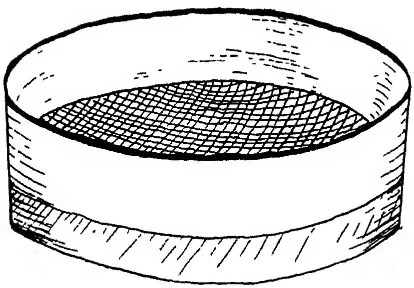


Fig. 2—Mesh Screen

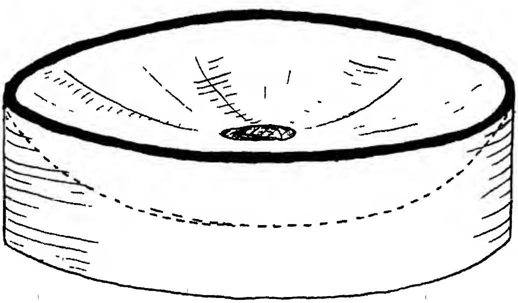


Fig. 3—Drying Basin

A good light. Poor light distorts your shapes.

A long, narrow table in the light. Also chairs, shelves, and display boxes, if you are conducting a class.

A damp box. This should be a metal box or a wooden box with a metal lining, having several shelves. A 3″ layer of plaster of paris should be poured into the bottom. If possible, each shelf should have a layer of plaster. The door must lock tightly. Keep the plaster saturated with water. (Fig. 1.)

Earthenware crocks for plaster and slip—enamelware will do.

Two or three enamel basins for casting and handling slip. One, three, or five quart basins are good sizes.

Mesh screen for screening slip—40 wires to an inch. (Fig. 2.)

Bats. These are flat discs of plaster of paris, made by pouring the plaster into well-greased pie-tins and turning them out when set.

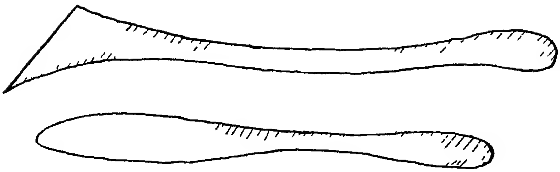


Fig. 4—Modeling Tools

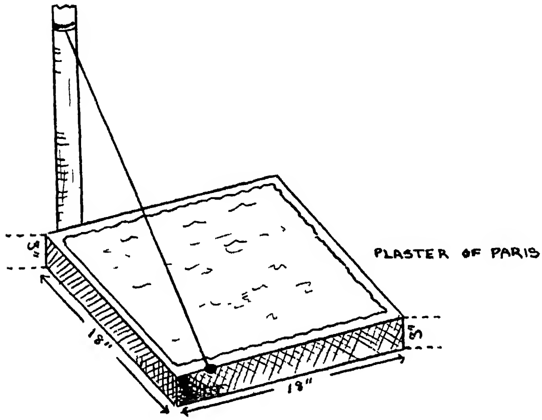


Fig. 5—Wedging Board

Drying basin. This is a large size bat with a concave center. It is made by inverting a basin, greasing the bottom, building a wall around it, and pouring in plaster. When the plaster is set, remove the basin. (Fig. 3.)

Modelling tools. These can be made of any hard wood, shaped to suit the individual taste. (Fig. 4.)

Wedging board. Make a shallow wooden box, 18″ × 18″ × 3″, fill it with plaster of paris, attach a perpendicular rod to the back of the box, and run a strong, fine wire from the top of the rod to the front of the box. (Fig. 5.)

Supplies

Clay—Natural clay can be found in cellars, excavations, railroads, and road cuttings, and also along the banks of streams. Your county or state geologic bureau will tell you where to find clay beds in your community. It usually appears as a greenish or bluish substance of close and uniform structure, occasionally containing stones, leaves, twigs, etc., which must be removed.

Clay must be plastic and porous and become hard and stone-like when heated to a high temperature. This process is called firing.

The chemical formula for clay is hydrated silica of alumina. Prepared clay can be bought for a few cents a pound. It comes in varying shades of grey, buff and red. When buying, find out at what temperature the clay fires. With natural clay, you will have to experiment to find this temperature.

Plasteline—This is a prepared, commercial modelling clay, which does not

harden and can be used over and over again. It is best for modelling work which is to be cast, as it does not shrink or warp in the drying, and is easier to remove from a plaster of paris mould than clay. It cannot be fired and costs four times the price of the pottery clay.

Plaster of paris—This is used for casting.

Glazes—These are oxides which are used for decorating pottery after it has been fired the first time. They make pottery watertight.

Note—Many commercial art supply houses sell a prepared clay which can be fired in an ordinary baking oven. A special glaze is sold for this clay. Follow the manufacturers' instructions.

CARE OF CLAY

If a natural clay is used, it should be dried and pounded to a powder and then put through a wide mesh screen to remove stones, leaves, twigs, etc. Mix it with water until it pours easily, and put it through a fine mesh screen #40. Allow the clay to stand in an earthenware crock to age, keeping it well covered with water. This liquid clay is called slip. If you wish to use the clay immediately, pour the slip into a drying basin, and the plaster will absorb the water. When the clay becomes leather hard, remove it from the basin and wedge it.

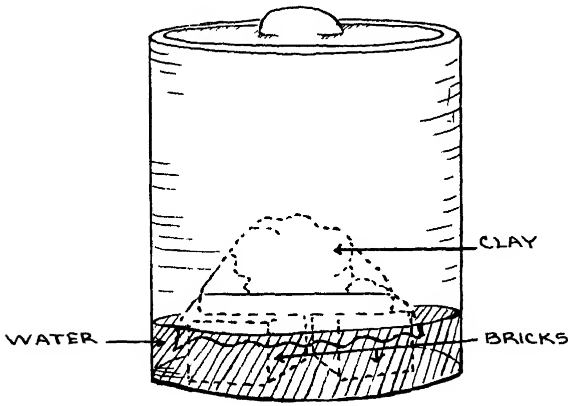


Fig. 6

Wedging—Wedging is necessary to remove all lumps and air bubbles from the clay. These bubbes can cause the pottery to explode in firing. Shape your damp clay into a ball, cut off a slice on the wire of the wedging board, and throw it down forcefully on the board. Cut off another slice

and throw it on the first slice. Keep repeating this until your clay shows a smooth, even texture when cut. Add water when necessary.

Balls of wedged clay can be kept for future use by placing them on a plaster bat, placing the bat on a few bricks in the bottom of a crock, and filling the crock with water to the top of the bricks. Cover the clay with a wet rag, letting the edges of the rag hang in the water. Keep the crock closed. (Fig. 6.)

A natural clay should be aged by keeping it standing in the slip form for several months. The Chinese often use clay set aside to age by their grandfathers, and they, in turn, set aside clay for their grandchildren to use.

COIL BUILT POTTERY

This is one of the oldest methods used and is still popular among the American Indians and other primitive peoples.

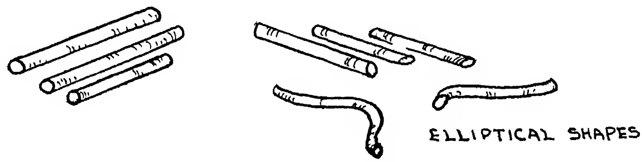


Fig. 7—Clay Coils

Form your wedged clay into coils by rolling between the hands. The coil should be about the thickness of a pencil for a pot up to 4″ in diameter; for other sizes, the coil should be in proportion. The coil should be even in thickness. Press the coil gently until a cross section assumes an elliptical shape. (Fig. 7.)

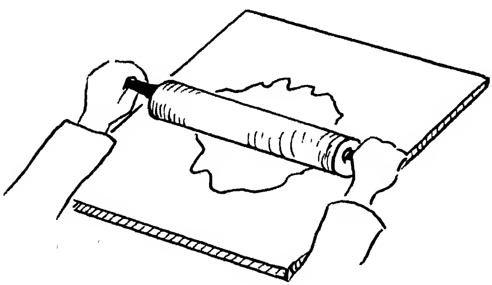


Fig. 8—Coil Built Pottery—Rolling Bottom of Pit

The bottom of the pot can be made by rolling out a lump of clay to the thickness desired with a rolling pin, and then trimming to the desired shape, or by coiling the elliptical strips of clay around and around until you have the shape and size you want. (Fig. 8.) If the latter method is

used, be sure to weld the coils together very firmly with pressure and slip.

Build up the sides of the pot by adding one coil of clay to another. Use one piece for each additional layer. Join by cutting both ends on the diagonal, so that they join on a broad surface. (Fig. 9.) Before joining one

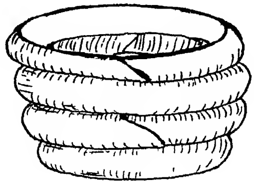


Fig. 9—Coil Built Pottery Building Up Sides

coil to another, slightly score both surfaces that will touch, and moisten with slip. (Fig. 10.) Shape the pot as you add each additional coil, by

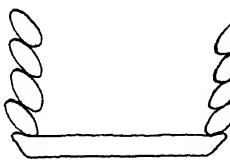


Fig. 10—Cross Section of Coil Built Pot

making the coil larger or smaller than the previous one. Weld each coil to the one below by pressing with the fingers. The coils can be smoothed out entirely in this welding if desired, or smoothed only on the inside or on the outside, leaving the other side as a decoration. After adding a few coils, set the pot aside to dry for a while, or the weight of the top coils will cause the pot to collapse. Score and moisten the upper clay unless both surfaces contain approximately the same amount of moisture. Otherwise, in drying, both surfaces would shrink at a different rate and separate

When the pot becomes leather hard, it can be scraped and smoothed and decoration added. The pot must be bone dry before it can be fired, or it may shatter. The best way to test for dryness is to place the pot on a smooth, hard surface such as glass or porcelain, and leave it for a few hours. If moisture collects under the pot, it is not dry enough. Drying usually takes several weeks, depending on the weather and the climate.

SLAB BUILT POTTERY

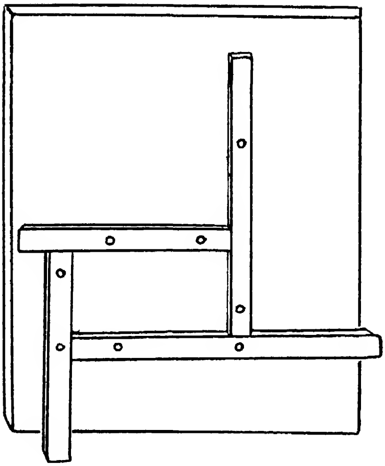


Fig. 11

Build a mould for your slab by nailing thin strips of wood the thickness of the slab you desire to a piece of board. (Fig. 11.) Place a lump of wedged clay in the box formed by these strips, and run a rolling pin over it. A rolling pin made of plaster and moistened is best, though a wooden one can be used. A little powdered chalk or grog (pre-fired clay) will keep it from sticking to the clay. Allow the slab to dry slightly, and then turn it out of the mould. When you have the desired number of slabs, join them together by scouring and moistening the edges and filling in the cracks with slip. These slabs can be decorated and fired individually as tiles.

SLIP CASTING

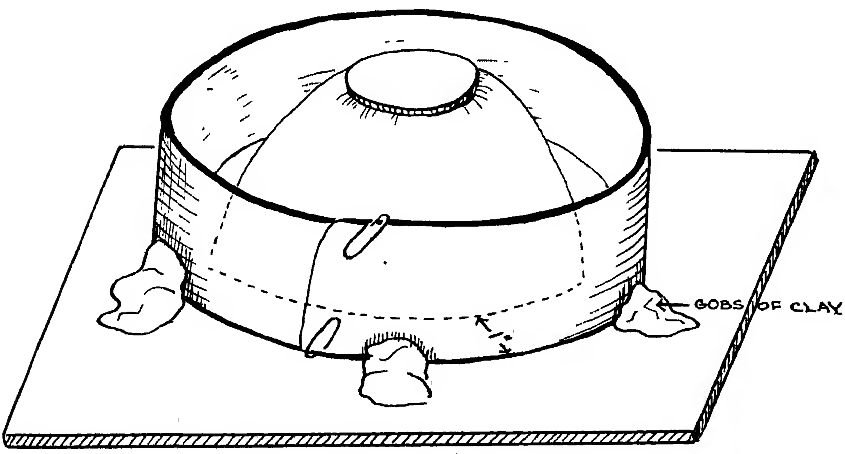


Fig. 12—Slip Casting Mold

A plaster mould must be made of a figure, tile, or pot, which is to be cast in slip. If the model is a plate or a pot which is wider at the neck than at the bottom—in other words, has no undercuts—the mould can be made by greasing the outside, and turning with the mouth down on a board. With a strip of cardboard and some paper clips, build a wall about 1″ from the edge of the pot, and fasten this down on the outside with small lumps of wet clay. (Fig. 12). Prepare your plaster in the following way: for a full pan of plaster, fill the pan two-thirds full of water, sift the plaster through a screen or over the hand to remove all lumps, and keep adding the plaster to the water without stirring, until the plaster shows above the water. Let the water seep up through the plaster for a minute or so, and stir slowly with the hand, breaking up all lumps. Pour the plaster over the pot until it is 1″ above the bottom of the pot. Allow it to harden, remove the paper wall, and slip out the grease pot. Wash the mould to remove grease, and allow it to dry thoroughly.

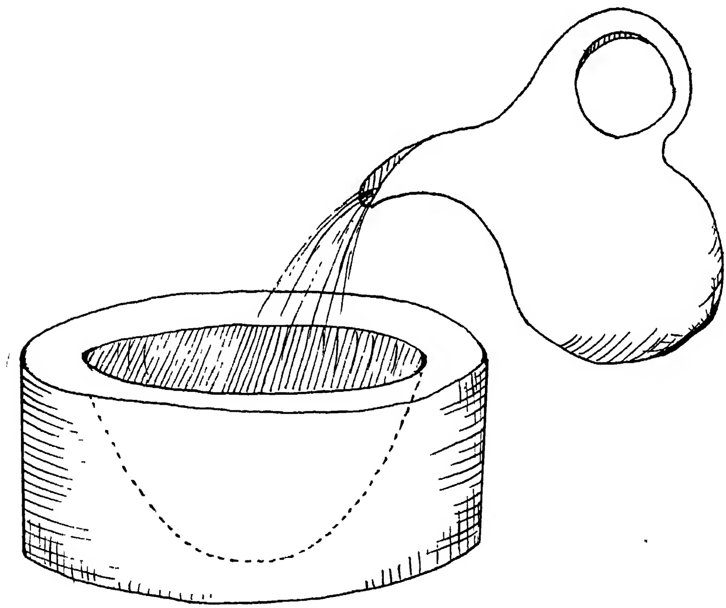


Fig. 13—Pouring Loose Slip into Dry Plaster Mold

Prepare loose slip and pour it slowly into the dry plaster mould. Pour on a smooth surface, and allow the slip to flow into the crevices to avoid air bubbles. (Fig. 13.) Shake gently to force possible bubbles up to the top. Fill cast to overflowing, as the slip will shrink when the water is absorbed by

the plaster. Allow the cast to stand for a few minutes, scrape the edge of the slip to see if it has hardened to the thickness desired, and then pour out the excess slip into the slip crock. Allow the cast to become leather dry before removing from the mould. When removing the mould, be careful that the clay is not pulled out of shape. As drying clay shrinks, slight undercuts can be disregarded in the mould. Deeper undercuts can be trimmed down with a knife. If the undercuts are very deep, a two-piece mould is necessary.

PRESSURE MOULD

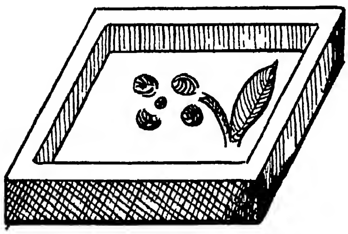


Fig. 14

Decorated tiles and appendages for pots, such as handles and spouts, can be made in a pressure mould.

A plaster of paris mould without undercuts is made from the original model. (Fig. 14.) Powdered chalk or grog is sifted into the mould, and the wedged clay is then carefully pressed into the mould so no air spaces are present. When the clay dries slightly, it can be turned out.

This method is especially good for tiles, as large quantities can be turned out in a short time. Raised designs can be modelled on the original tile, The negative mould will reproduce these designs accurately.

DECORATING

Three-dimensional decorations can be made—

By leaving the coils on the inside or outside or on both sides of coil-built pottery, or by pinching the coils at regular intervals in order to weld them.

By incising designs with modelling tools while the clay is still damp.

By building up or modelling designs with clay.

Two-dimensional designs can be made—

By inlaying coloured slip in incised designs.

By painting with under-glazed colours before applying glaze.

By applying coloured glaze.

By painting over the glaze and applying a coat of clear glaze over the design.

By dipping the damp pot into a slip of another colour, and when leather hard, cutting through the coating of slip and peeling it off in patterns.

FIRING

Firing is the process of heating clay to a high temperature, at which it begins to vitrify and assumes a hard and permanent form. The temperature necessary varies with the type of clay. When buying a commercial clay, be sure to find out the firing point. There are especially prepared commercial clays which can be fired in an average oven heated to 250° F.

Since an ordinary oven cannot reach the high temperature necessary for firing unprepared clay, a special oven or kiln must be used. There are many kilns on the market heated by electricity, gas, or coal. However, a primitive kiln can be made out of doors. Get a large metal drum, remove the top, and pour about 3″ of coarse sand in the drum. Place a layer of pots on the sand and cover with more sand, alternating with layers of pottery. Place the cover on the top layer of sand. (Fig. 15.) The drum is then entirely

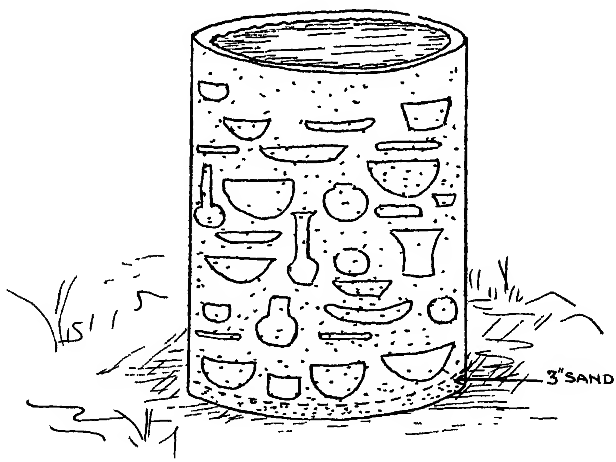


Fig. 15—Outdoor Kiln (Cross Section)

covered with logs of wood which are set afire. (Fig. 16.) Keep this fire burning for approximately 8 hours, and then stop replenishing the logs so that the fire burns down gradually. Allow the pots to cool for several hours before removing them from the drum. Start your fire slowly, so that any moisture in the pots will have a chance to evaporate. A strong heat at the beginning of the firing will result, if any moisture is present, in

causing the pots to expand suddenly, and will probably shatter them. The important thing is to keep the heat high and evenly distributed. The presence of the sand will help distribute the heat. Pots must be bone dry before firing. Thicker ware or statuettes must be fired longer.

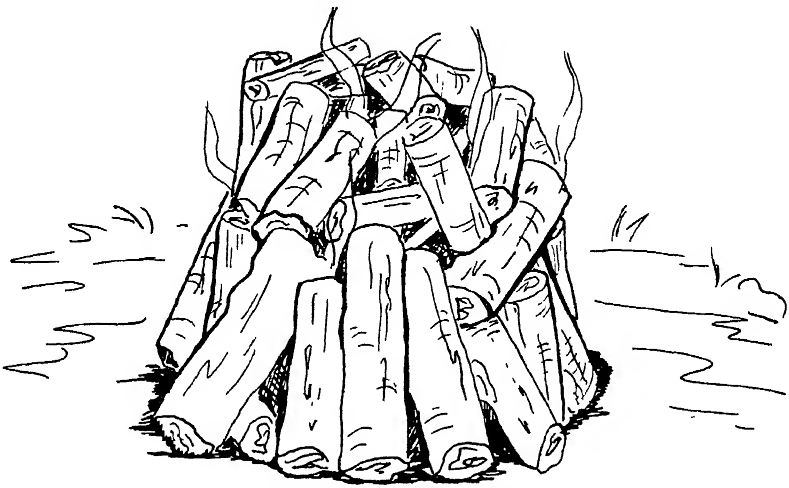


Fig. 16—Firing Outdoor Kiln

In a commercial kiln, three small cones are placed within the kiln in view of the spy hole. The first one will bend at a temperature lower than that needed to fire the clay, the second at firing heat, and the third at a higher temperature. When you notice the first cone bend over, get ready to turn off the heat. The middle cone is the one indicating at which temperature the pottery fires. When this one bends over, turn off your heat and allow the oven to cool. The pots should be allowed to cool slowly. In setting the pots in the kiln, it does not matter if they touch during the first firing. They can even be stacked one inside the other, as long as the hot air can circulate around all of them.

Pottery which has been fired once is called bisque or biscuit. It is much lighter in color than the original clay and is quite porous. Pots which have only been bisqued will allow water to seep through unless treated with varnish or shellac, or other waterproofing material. However, they can be decorated artistically and waterproofed, if glazing is not possible

GLAZING

Glazing is a process of waterproofing and decorating with the use of oxides. Different chemical combinations will give a large variety of colours. However, as this calls for some knowledge of chemicals, it is suggested that the beginner buy the glazes already prepared, and follow the directions given by the manufacturer.

Glaze comes in powdered form and is mixed with water. It is then applied to the bisqued pot by dipping, or applied with a brush or a spray gun, if available. The important thing is to get an even coat of glaze. If applying glaze with a brush, use a fine camel hair brush and allow the glaze to flow on. Immerse small pots in the glaze and allow it to drain off.

After the glaze has been applied, the pot must be fired once more, this time to a temperature necessary for setting the particular glaze which you have used. In firing glazed pots, they should be placed in the kiln so that they do not touch each other. It is also best to raise them on little stilts especially provided for that purpose, as the heated glaze has a tendency to run down, and will cause the pot to stick to the shelf on which it is standing. Do not try to glaze pots in the homemade kiln described above.

CLAY MODELLING

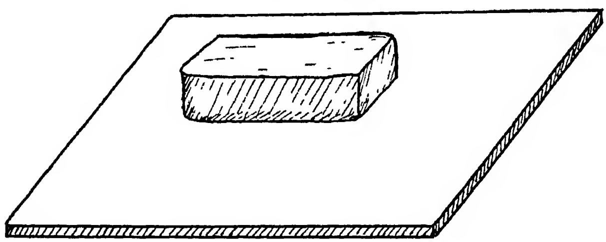


Fig. 17—Board Armature with Wood Block

After the beginner has made some simple pots, he might like to try his hand at sculpturing. A mask makes an interesting project for a first attempt, For an armature, use a bat or plain wooden board, which has been sand-papered to remove any splinters. You can use either pottery clay or plasteline. If you use clay, you will have to keep your work covered with rags soaked in water and a piece of oilcloth, or several thicknesses of newspaper over the rags. If a board is being used as an armature, it is a good idea to nail

a block of wood in the centre to hold the head on the board, and also to save a certain amount of clay. (Fig. 17.)

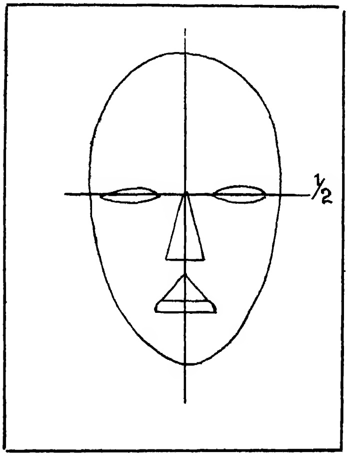


Fig. 18

Build up a half egg of clay on the armature, and divide it in half both ways with lightly marked lines. The horizontal line will give you the position of the eyes. The lower half is divided into thirds, the upper third for the nose, and the line dividing the two lower thirds marking the position of the mouth. (Fig. 18.) Build up the features with clay. Do not try to carve them out of the basic form. When your modelling is completed, smooth down all irregularities.

As the mask is bound to have undercuts, make a waste mould; that is, a mould which will be destroyed in producing your first copy. Build a wall of clay all around the mask, allowing about 1″ around the edge. This wall can also be made of a strip of cardboard or linoleum, held in place with clay. (See casting of model for pot.) Mix a small amount of plaster of paris, tinting it with ink, dye or water-colour. Cover the mask to approximately ¼″ thickness with this tinted plaster. Be sure all undercuts are filled with plaster by blowing into them to break any air pockets. When the tinted plaster has set, mix white plaster and pour over the mask to a thickness of 1″, and then allow the plaster to set. If the mask is modelled in plasteline, it is best to remove it from the mould as soon as the setting plaster has begun to cool. The heat of the setting plaster will have softened the plasteline so that it will have come away clean from the mould. If clay has been used, wait until the clay has dried and shrunken away from the mould, and then remove it.

We are now ready to cast our positive, which will be an exact copy of the original mask. This can be made in any number of materials. In order to make a plaster positive cast, we will have to soak our mould in water until it stops bubbling and we know the saturation point has been reached. The mould should be washed clean and a thin coat of grease or liquid soap put inside. Mix enough plaster to fill the mould and, while it is still quite liquid, pour it into the mould very carefully. It is best to pour on a large,

smooth surface and allow the plaster to flow into the crevices. When the mould has been filled to the brim, shake it slightly to make any air bubbles that might be present rise to the surface. Make a U-shaped coil of wire (Fig. 19), and when the plaster has thickened well enough to hold the weight of wire, set it into the plaster to serve as a loop for hanging. Before the plaster has become entirely hard, the back can be scooped out a little to reduce the weight. If there are any narrow protuberances, such as whiskers, hair or horns, they should be reinforced with wire before the plaster sets. (Fig. 20.)

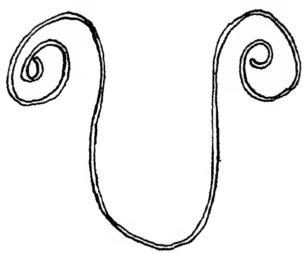


Fig. 19—Wire Coil for Hanging Finished Project

When the plaster is set hard, remove the negative mould. This should be done with a mallet and a small chisel or screwdriver. Start chipping the plaster at the outer edges. Always hold the chisel at a tangent to the positive cast. A slight, sharp blow with a mallet on the back of the chisel will give the best results. When you reach the coloured layer of plaster, work very carefully. (Fig. 21.) The plaster will have to be picked out carefully from around the eyes, nose and mouth. Do not try to chip off large pieces, because these will often come off with parts of the positive cast. If any parts are broken off the positive, they can be mended by soaking both the positive and the broken pieces in water and joining them with a little fresh plaster. Holes can also be filled with fresh plaster and the mask smoothed down with a plaster file.

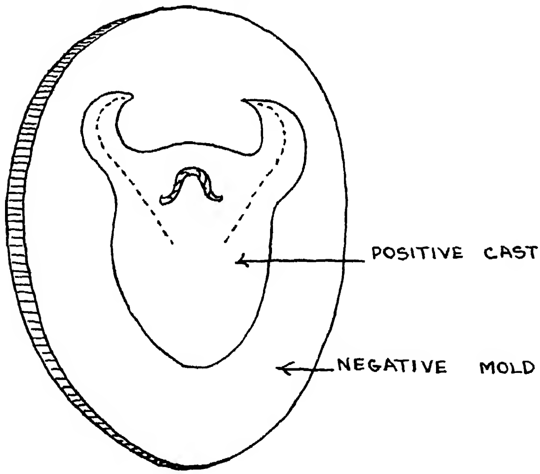


Fig. 20—Positive Cast and Negative Mould

Let the head dry for several days before painting. Give it two coats of thin shellac, and then paint with oil or water colour. Metallic paint can also be used. All sorts of dramatic effects can be obtained by mixing oil paints

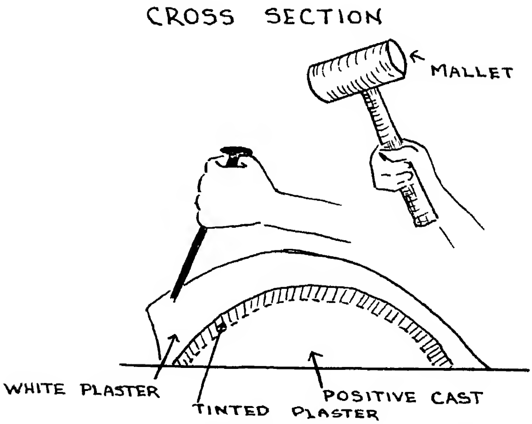


Fig. 21—Removing Negative Mould

and metallic paints. An antique effect can be obtained by painting the head with a light colour and, when thoroughly dry, painting it over with a dark colour. With a rag, wipe off the wet paint from all the high spots, leaving it in the depressions. The masks can also be ornamented with fabric, yarn, feathers, beads, etc.

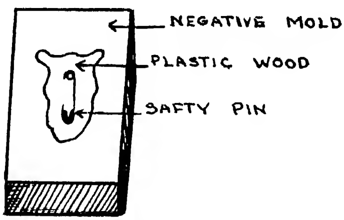


Fig. 22—Plastic Wood Pin Mask

Small masks can be reproduced in plastic wood and worn as pins. Cast in a one or two piece mould. Soak and grease the mould. Flatten a lump of plastic wood in the hand and press it into the mould, forcing the plastic wood into all the crevices. Fill up the mould and insert a safety pin. (Fig. 22.) You can allow the positive to dry for 24 hours before removing, or remove it immediately by placing the mould in a pan of water and shaking out the positive. It is wise to coat the hands with grease before handling plastic wood. Work quickly, as it dries rapidly.

Young children, when left to their own devices, usually model small animals, which they have seen pictured in their fairy tale books or in the zoo. If these are modelled in pottery clay, they can be preserved without firing by allowing them to dry and giving them several coats of thin shellac. If not handled, they will last several months. If the work merits preservation, cast it in plaster of paris. A mould of at least two pieces will be necessary for an animal figure.

To make a mould of more than one piece, some means of dividing must be used. For a two-piece mould, a cardboard box a little larger than the model to be cast will do. Half fill the box with plaster, and when the plaster begins to thicken slightly, carefully place the model in the plaster, so that the top of the plaster reaches the point at which you want the division in the cast. Place the legs of the animal against the sides of the box. With your fingers, make four holes in the corners of the surface of the plaster of paris. (Fig. 23.) When the plaster is set hard, grease the upper surface of the plaster, and fill the box with plaster of paris. When the second layer of plaster has set hard, tear off the box and pry open the mould. Remove the clay, wash the mould, and grease it. Tie the mould together and pour thin plaster into one of the legs. The air should escape through the opening in the other leg. When the plaster has set hard, work the mould off, and then smooth and paint the positive.

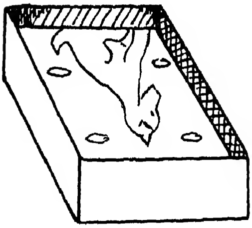


Fig. 23

In a two-piece mould, each half must be a draw mould, that is, it must come off the clay without distorting the clay in any way. In other words, a wide part of the clay model should not have to be forced through a narrow opening in the mould.

If the mould must be made in more than two pieces, in order to avoid undercuts, thin strips of brass or copper can be pressed into the clay model to form a wall where the line of division will come between the different sections of the mould. (Fig. 24.) The first section is cast, the pieces of metal known as shims removed, the side surface of the mould greased, and the second section cast, etc., until all the sections of the mould are cast. If the metal is unobtainable, a wall of clay can be used instead. All the pieces of the mould must be carefully fitted together and held in position while the positive is being made. This can be done by greasing heavily the outside of

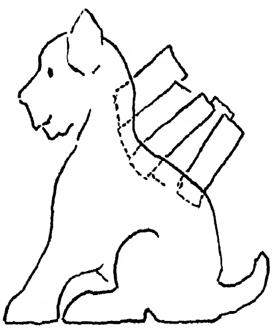


Fig. 24—Mould of more Than Two Pieces Showing Dividing Strips

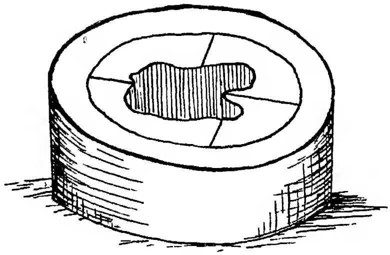


Fig. 25—Negative Mould

the assembled negative mould, and casting a shell of plaster around it to hold the pieces together while casting a positive. (Fig. 25.) If only one copy of the model is desired, it does not matter if there are undercuts in the mould. The mould can be chipped away from the positive.

To reproduce a model in papier mâché, grease the mould and apply layers of papier mâché as described in the chapter on Puppetry

VOCABULARY

Armature—Framework used for supporting modelling.

Bat—Flat disc of plaster of paris.

Bisque—Clay which has been fired once and is hard and porous.

Clay—Hydrated silica of alumina, which appears as soil of uniformly fine texture.

Damp Box—Box with plaster base, used for keeping unfinished work from drying.

Draw Mould—Negative mould which can be removed from positive cast in one piece without breaking or distorting positive.

Drying Basin—A bat with a concave centre, used for drying slip.

Firing—The process of heating clay to the point where it becomes hard and stone-like. When applied to glaze, it means the process of heating to a point where the powdered glaze melts and merges into a glassy coat.

Glaze—Metal oxide used for decorating and waterproofing bisque.

Greenware—Unfired pottery.

Grog—Clay that has been fired and pulverised.

Kiln—Special oven used for firing pottery.

Negative Mould—An impression of the original mould.

Plasteline—A prepared product composed of clay and some form of grease to keep it permanently soft.

Positive Cast—An exact copy of the original model, made by filling the negative mould.

Shims—Thin pieces of copper or brass, used for dividing the sections of a mould in casting.

Slip—Liquid clay.

Waste Mould—A negative mould which must be destroyed to release the positive cast.

Wedging—Process of pounding clay on a bat until a uniform texture has been achieved and air bubbles forced out.

CHAPTER XIII

Puppetry for Everybody

PUPPETRY IS ONE of the most delightful and many-sided of all hobby pursuits It is both art and craft, combining a number of activities and skills, and appealing to people of all ages.

It probably originated in ancient Hindustan. Some scholars have said that the Sanskrit word for "stage manager" literally means "thread holder," which suggests that marionettes were important in the theatre of ancient India. At any rate, we know that the history of puppetry goes back into the dim past. The mediæval church used puppets for some of its mystery plays, calling them "motions." The itinerant puppeteer was a great favourite with the country folk of England and on the continent at the rural festivals and wakes.

Recently there has been a tremendous revival of interest in this art. It is no longer practised only by professionals, but has made its way into recreational and educational programmes by virtue of its own inherent delights and merits.

Adults as well as children find happiness and escape into the realm of fantasy through the magic door of puppetry. Nursery school children dramatise their rhymes with simple puppets they have made themselves, and in the upper grades the more difficult types are suitable for group activity by means of which essential subject matter is taught. For parties and fairs, particularly around holiday time, they are appreciated by adults, and for topical fun they have great possibilities. Construction is interesting as an occupation, and puppet shows make lively impromptu entertainment.

In this chapter you will find instructions for making simple puppets and suggestions as to their use at home or in school. Do not be afraid to experiment with materials and methods.

Experimentation and spontaneity are in the very nature of puppetry. One amateur puppeteer found inspiration in the kitchen and made workable marionette beetles and strange prehistoric looking animals from apple corers, milk bottles, funnels, etc.

PAPER BAG PUPPETS: NURSERY SCHOOL CHILDREN TO ADULTS

Uses

Children

This type of puppet is best for dramatising nursery rhymes with action, such as: "Little Miss Muffet," "There Was an Old Woman as I've Heard Tell," "Jack Sprat," "Pussy Cat, Pussy Cat, Where Have You Been?"

Adults

Try impromptu dialogue, notable characters, and popular songs, such as "Oh, Johnny, Oh, Johhny," "Playmates," "Schooldays," "Down by the Old Mill Stream."

For Party Entertainment

Give each guest a brown paper bag containing scraps of coloured construction paper, and some pins or paste. Suggest a subject or subjects, set a time limit, and then start them off making their puppets. Prizes may be given for the best and the poorest. For themes suggest "My favorite star," "Guess who?," famous characters from history and literature, or whatever might interest your group. Large size paper bags can be made into animal heads and used as masks.

Construction

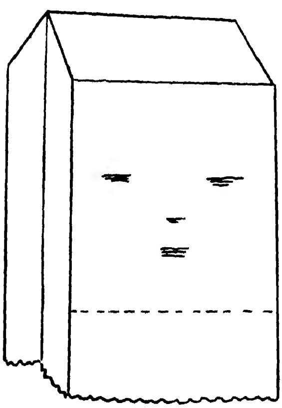


Fig. 1—Features Marked on Paper Bag Puppet

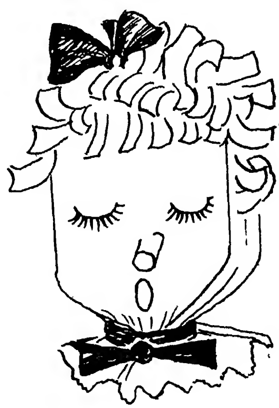


Fig. 2—Finished Paper Bag Puppet

Before you start planning the features, open the paper bag as though you were going to fill it. Size eight is best for ordinary characters, but it is useful to have some smaller bags and a few extra large ones for characters such as giants, pygmies, or little creatures of fable and fancy.

Mark the position of the features lightly in pencil, being sure not to place the eyes too high. Remember to allow for a forehead when the bag is opened. Leave enough space at the bottom to tie the bag on the wrist with a piece of ribbon or crepe paper. (Fig. 1.)

The features should be cut from coloured construction paper and pasted on the bag. A nose that stands away from the bag helps to give the head a little more roundness. Cylinders or triangles of paper make good noses. Make the features large. (Fig. 2.)

Hair can be made from fringed paper.

For animals, two bags are needed. Open one bag to its fullest extent and cut down on the corner folds one-third of the way. Corners C and D should be cut two inches farther down than A and B, in order to tip the head forward a bit. (Fig. 3.)

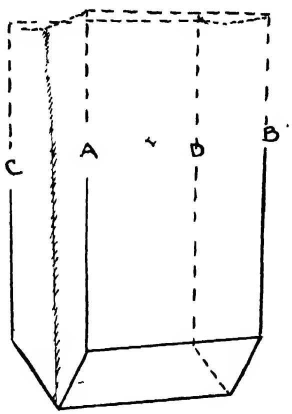


Fig. 3—Cutting Two Paper Bags for Animal Puppet

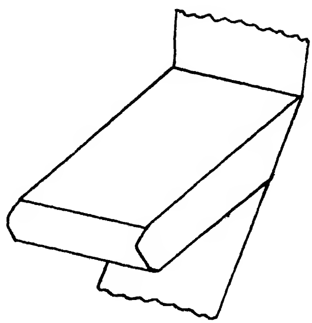


Fig. 4—Animal Head of Paper Bag Puppet

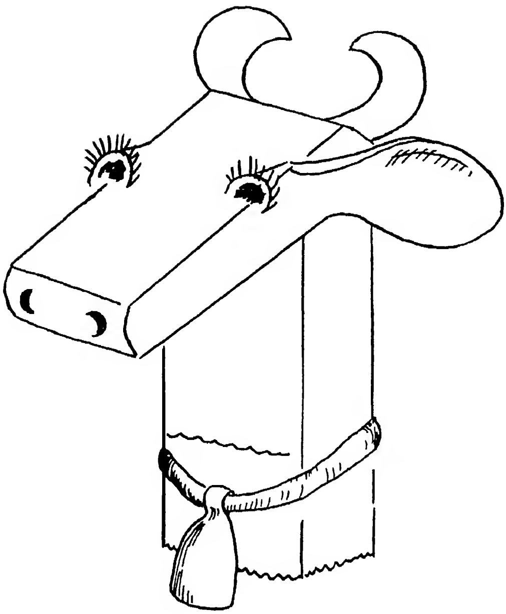


Fig. 5—Completed Animal Paper Bag Puppet

Fold the two narrow side flaps inside the bag. Fold the top flap up and the bottom flap down. (Fig. 4.) Place the top flap over the top of the other bag and paste. Paste the bottom flap against the front of the other bag. The top flap may be left standing up and used for ears. If you wish ears to extend from the sides, use the two side pieces instead of folding them under, and paste down the top piece. (Fig 5.)

For short-nosed animals, cut the corners of the first bag deeper. For a narrow nose, fold in the edges of the first bag.

Manipulation

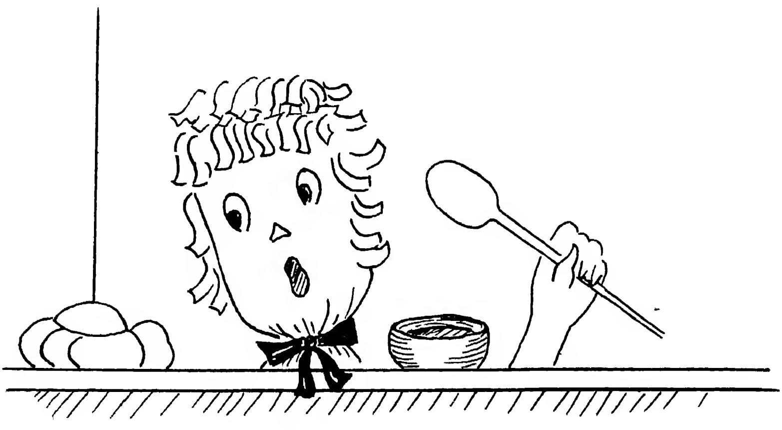


Fig. 6—Manipulation of Paper Bag Puppet

These puppets are manipulated by placing the puppet on one hand and tying it to the wrist. Hold the puppet over your head and use the other hand as if it were the puppet's hand. For practice, make your puppet say, "Yes," "No," make him suck his finger, cup his ear, or pick up something. (Fig. 6)

Remember the following things while giving your performance·

Hold the puppet high enough to be seen.

Bring it on or take it off stage at the side not in view of the audience

Lift the puppet slightly as it moves upstage or to the back of the stage.

Keep your eye on the puppet while it is on the stage, so that you always know what it is doing. Use your free hand for gesturing, picking up things, etc. Speech and gestures should be exaggerated. Be sure the voices are loud and distinct.

RUBBER BALL PUPPETS

For Children Seven Years Old to Adults

Uses

Appropriate for dramatising folk and fairy tales, holiday themes, stories from school readers, and original stories.

Construction

Get a rubber ball and cut a hole in it just large enough to fit the top of your index finger. (A discarded tennis ball will do.) The ball will make the head of your puppet. The inserted index finger will support the head.

Cut the features from coloured construction paper, felt, sponge rubber, yarn, etc., and glue them to the ball. Hair can be made of paper, wool, rope or fur. (Fig. 7.)

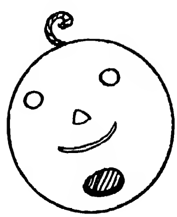


Fig. 7—Rubber Ball

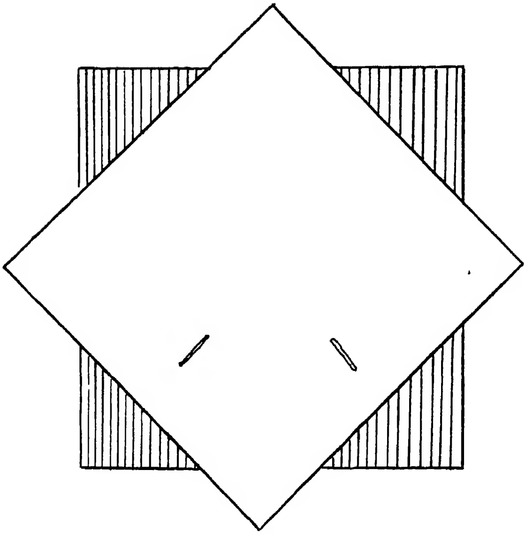


Fig. 8—Cutting of Cloth for Rubber Ball Puppet

The body is made from a square of cloth. Find the centre of the square. Place it over the index finger, and insert your finger into the hole in the ball. Cut the cloth in two places, to allow the thumb and middle finger to come through. Bind these holes to prevent ravelling. Variations of the costume can be obtained by changing the shape of the cloth or using two or three pieces differently arranged (Fig. 8.)

Fruits or vegetables can be used instead of a rubber ball. Cut the features out of the fruit, or stick thumb tacks into it. (Fig. 9.)

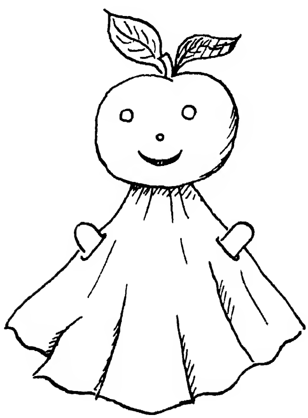


Fig. 9—Puppet Made With Fruit in Place of Rubber Ball

A more economical method is to grease the fruit or vegetable slightly and cover it with four or five layers of papier maché. (Instructions for papier maché work, can be found in this chapter under Hand Puppets with Papier Maché Heads—see section on Construction.) Then remove the papier maché, by cutting it in half. Join again with more papier maché, leaving a hole for the index finger, and paint.

Manipulation

Manipulate your puppet by moving your fingers, hands, and arms. Practise clapping the puppet's hands together, nodding its head, putting its hands to its ear, picking up an object, etc. (Fig. 10.)

Fig. 10

ALL CLOTH HAND PUPPETS

For Children Ten Years and Up

(This puppet requires a good deal of sewing)

Uses

These puppets are most suitable for use with groups of girls. They can be used for dramatising the same type of stories as those dramatised with rubber ball puppets.

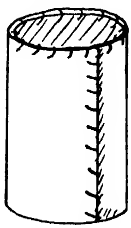


Fig. 11

Construction

Fold in half a square of buckram, four inches by four inches. Roll around the top of the index finger with the fold toward the base of the finger. Sew closed. This tube will be the neck of your puppet. (Fig. 11.)

Cut a circle of cloth nine inches in diameter. Run gathering stitches around the edge, using a very strong thread. Stuff tightly with cotton batting and draw together around the middle of the tube. Sew the head carefully to the tube. (Fig. 12.) If the top of a stocking is being used for the head, gather one open end tightly, and sew closed. Stuff the bag thus formed, gather the other end around

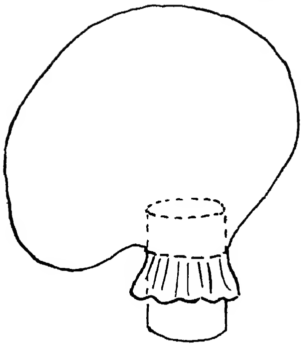


Fig. 12

the tube, and fasten carefully with several stitches.

Adjust the head on the tube at a natural angle and appliqué the features with coloured cloth or felt. A three-dimensional nose can be made by cutting a small circle of material, gathering the ends together and, stuffing. A pointed nose can be made by stuffing a small cone of cloth and appliquéing it to the head.

Make the costume and attach it to the head, sewing the neck of the dress around the tube. The costume can be made like a dress with short sleeves. A simple costume can be made by taking a strip of material ten inches wide and twenty inches long, and gathering the long end around the neck. Sew up the back. If a boy's costume is desired, cut the front of the costume half-way from the bottom, and join the sides of this slit to either side of the back opening. The top part of the back opening is left open, in order to allow the hands to be inserted. (Figs. 13 & 14.)

Fig. 13

Fig. 14

Completed All-Cloth Hard Puppets

Add hair and trim costume.

Place index finger into the head, and slit holes in the costume for middle finger and thumb to come through to form hands.

Manipulation

Same as for rubber ball puppets.

HAND PUPPETS WITH PAPIER MÂCHÉ HEADS

For Children Eight Years Old to Adults

Uses

This type of puppet comes closest to the puppets used by professionals. It is suitable for dramatising all types of stories: Fairy tales, legends, fables, Bible stories, original stories, amateur skits, etc. A standard set of characters can be made and used over and over again for all plays.

The following are suggested: old man, old woman, middle-aged man, middle-aged woman, teen-aged boy and girl, boy and girl of about eight years, and baby. The old couple can be used as grandmother, grandfather, witch, or minor character The middle-aged couple can be parents or step-parents. The teen-aged couple can be used as the hero and heroine. The young children can be used as "Hansel and Gretel," "Goldilocks," "Little Red Riding Hood," etc., and, of course, babies come in handy for "Punch and Judy," the baby in "Rumplestiltskin," or the "Sleeping Princess." We suggest that these characters be dressed in simple fairy-tale costumes with accessories, such as hood, ball gown, head dress, etc., that can be easily slipped on.

Construction

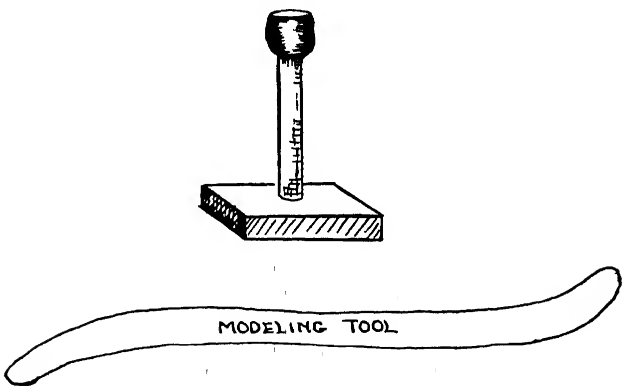


Fig. 15—Wooden Armature and Modelling Tool

Head—A wooden armature should be made to support the clay head (Fig. 15.) A long-necked bottle with the bottom weighted can be used for an armature.

Build up an egg-shaped mass on the top of the armature with a piece of plasteline. The axis of the egg should run at an angle to the small end of the egg at the bottom. (Fig. 16)

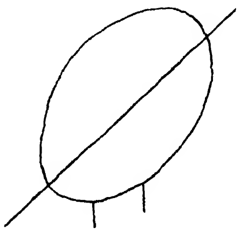


Fig. 16—Building Papier Mâché Head

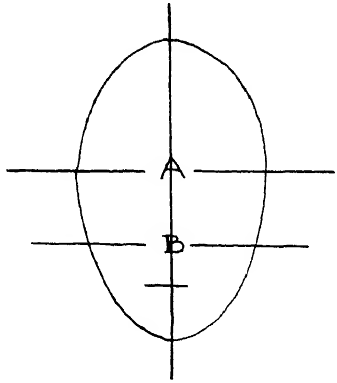


Fig. 17—Papier Mâché Head Determining Position of Eyes and Nose.

Draw a horizontal line one-third of the way down. This will mark the position of the eyes. Divide the remaining section in half. The space between A and B will give the position of the nose. (Fig. 17.)

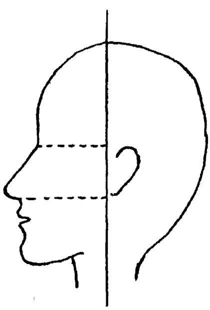


Fig. 18

A horizontal line drawn one-third of the distance from "B" to the chin will mark the position of the mouth. Build up the nose, cheekbones, brows and mouth by adding plasteline. (Fig. 17.)

Use your modelling tool to shape and finish the features. (Figs. 15, 18 and 19.)

Divide the side of the head in the centre with a vertical line, place the ear on this line, on the back half of the head as shown in the drawing. (Fig. 18.)

To papier mâché head, use wallpaper paste, and paper of the same thickness as brown paper bags. First rub clay with vaseline. Wet paper thoroughly and wring out water. Tear off a piece about $8\frac{1}{2}'' \times 11''$ and cover with

paste which has been mixed with water to the consistency of heavy cream. Tear off pieces about the same size and cover your clay head with a layer of over-lapping pieces. (Fig. 19). The first layer has paste on the side away from the clay.

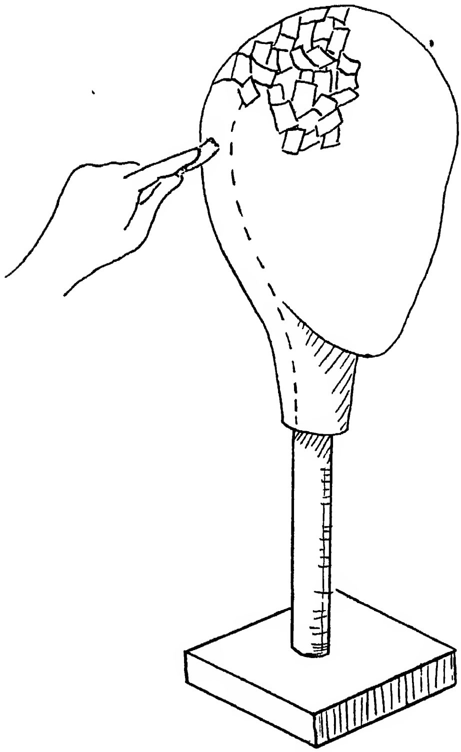


Fig. 19

Cover the head with four layers of paper in alternating colours, in order to insure the same thickness all over the head. Press the paper carefully around the features with a modelling tool. When the head is dry, cut off back half, remove clay from head, and replace back, joining seams with more paper. Reinforce the edge of the neck.

Body—Trace the pattern and allow ¼″ for seam when cutting. The traced line is the line on which you sew. Use a double thickness for each leg. (Fig. 20.)

Sew body and leg on the traced line, leave the top and bottom of the leg open, and turn the body and legs inside out after notching the corners. Hem the bottom of the body.

Cover the cardboard sole with the cloth sole by running gathering stitches around the cloth sole and drawing together. (Fig. 21.)

Pin the completed sole to the bottom of the leg, turning in the ¼″ seam allowance of the leg. Over-hand the sole to the leg. (Fig. 22.)

*

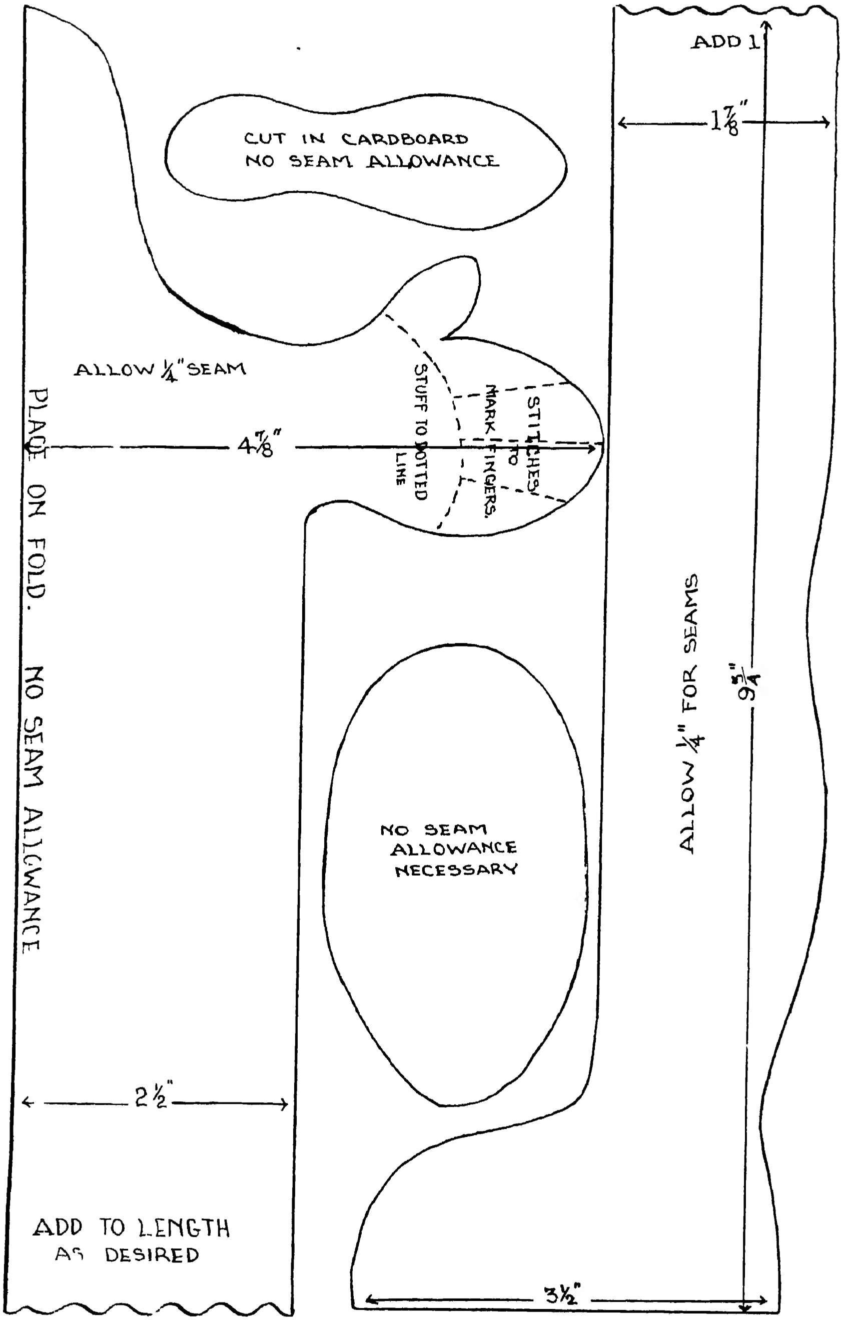


Fig. 20—Body Pattern

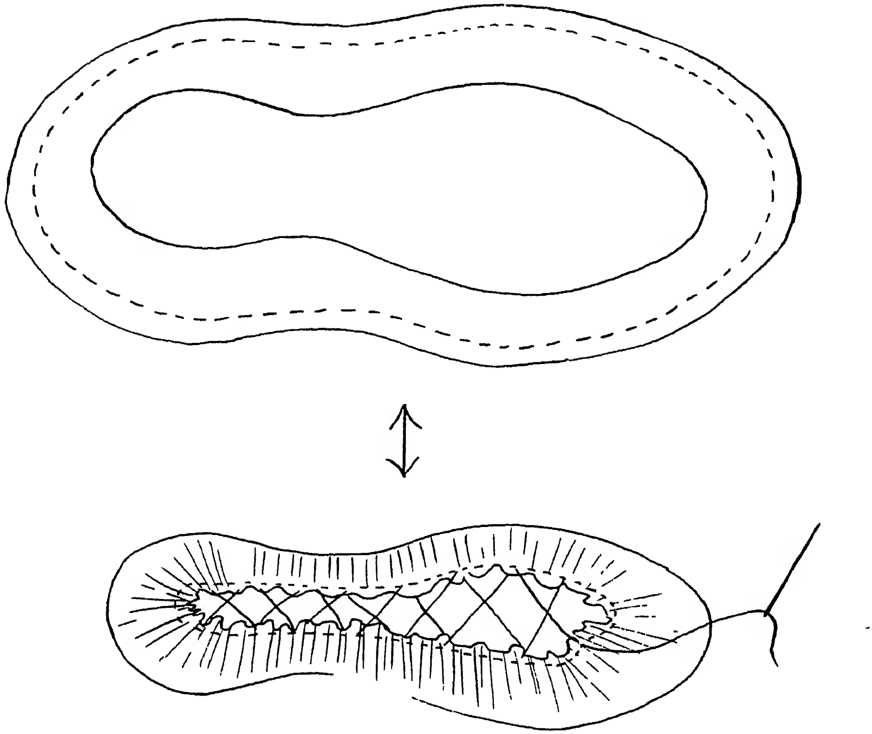


Fig. 21—Making Cloth Sole

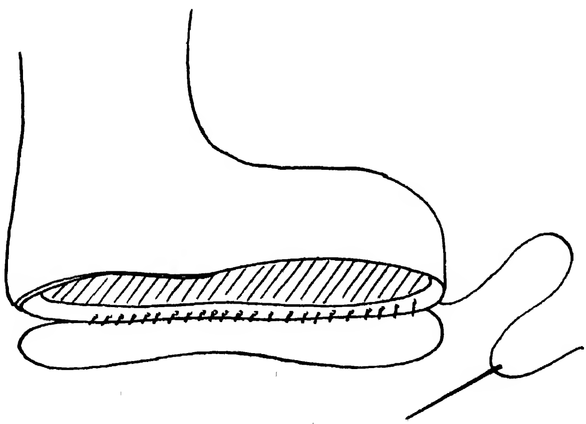


Fig. 22—Attaching Cloth Sole

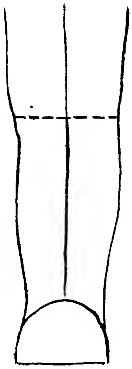


Fig. 23

Stuff the leg half way up and put in a row of stitches across the front. Stuff the rest of the leg and tack to the *front* of the body only, allowing 1″ space between the legs. (Fig 23.)

Stuff the hands half way and put in three rows of stitches to mark the fingers.

When the head is thoroughly dry, it is ready to be attached.

The hand is placed inside the body, as if for manipulation. The head is placed in position over the index finger. The body is turned back over the head, and the body and head overhanded together around the neck. If the neck is too thick to be pierced with a heavy needle, the holes can be made beforehand with an awl. (Fig. 24.)

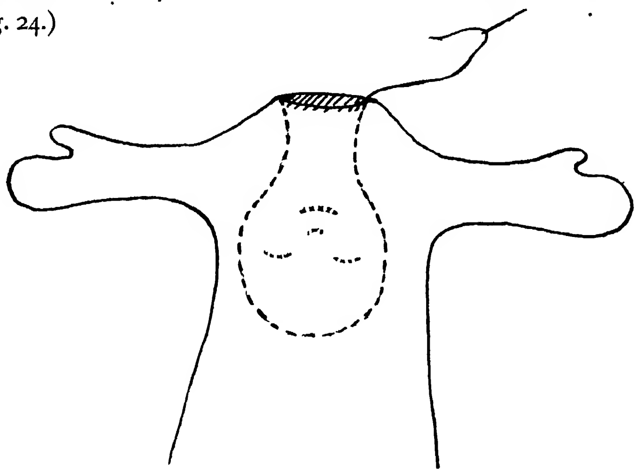


Fig. 24—Attaching Head

Place puppet on an armature. Mix fresh colour paint. Use white as the ground colour and add red, yellow and brown, until desired colour is obtained. Add a bit of blue to dull the colours, for an old or sickly person. Apply flesh colour to head and hands. While flesh colour is still wet, blend red into cheeks, and blue shadow between eye and brow. The shadow can be used in any hollows, for example, above chin, beneath cheek bones, at the side of nose. The joints of the fingers should be touched up with red and the spaces between the fingers marked with blue.

A little red blended into the nose, chin and forehead will put life into your puppet.

Paint the eyeball white and allow it to dry thoroughly. Then outline it in black and paint in the pupil. A small triangle of white may be left in the pupil as a highlight. (Fig. 25.) The white eyeball should not show above or below the pupil, unless a staring effect is desired.

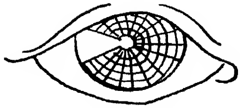


Fig. 25

Paint in the lips, putting a little blue into the paint for middle-aged or old people, turning up the corners for a smiling face and vice versa

Add a little pink to the ears and nostrils.

Costume your puppet, using the body pattern as your costume pattern. Keep the colours gay.

Wigs can be made from yarn, fur, steel wool, fringe, etc. To make a long-haired yarn wig, wind yarn in the form of a hank over some object, making each strand two times the length of the desired hair, measuring from the part to the ends. Slip hank off and sew ¼″ tape or strip of cloth down the centre, preferably by machine. Glue tape down centre of head. This will give you a centre part. Trim ends as desired. Arrange hair and glue to head, allowing ends to hang free. A rag tied tightly around head while glue is drying will hold hair in place.

If bangs are needed, sew short strands to a short piece of tape and paste across head at right angle to part before adding wig. (Fig. 26.)

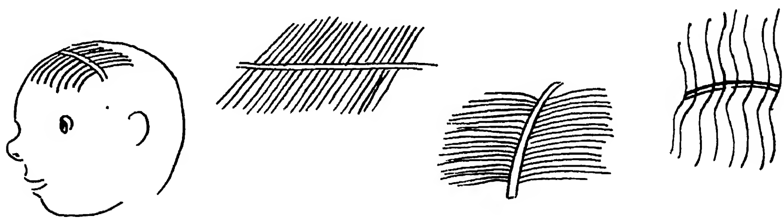


Fig. 26—Hair Detail

For a mannish hair comb, apply glue to back of head in desired shape. Put close layer of single strands over glue, strands running vertically. Tie strip of cloth around head tightly until glue dries. When the glue is dry, trim ends, making top layer shorter than bottom, and add a few strands for sideburns. (Fig. 27.)

To avoid mussing, wigs should be attached after puppet has been dressed.

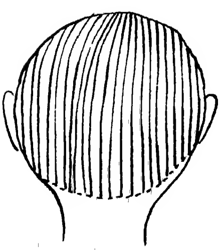


Fig. 27

Manipulation

Fig. 28—Manipulation of Hand Puppet with Papier Mâché Head

The same as for other hand puppets: The index finger in the head, and the thumb and middle finger in the two hands. (Fig. 28.)

SHADOW PUPPETS

For Children Five Years Old to Adults

The young children can make shadow puppets without any animated parts. The older children can make the more complicated form described below.

Use

Young children can dramatise nursery rhymes and simple stories; older children nature stories and Indian legends, as outdoor scenery is more effective on the shadow screen than indoor scenery. This type of puppet is very inexpensive to make.

Construction

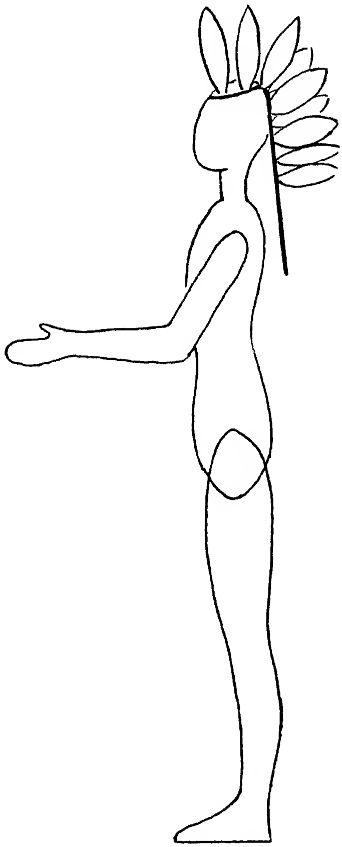


Fig. 29—Profile Drawing of Shadow Puppet

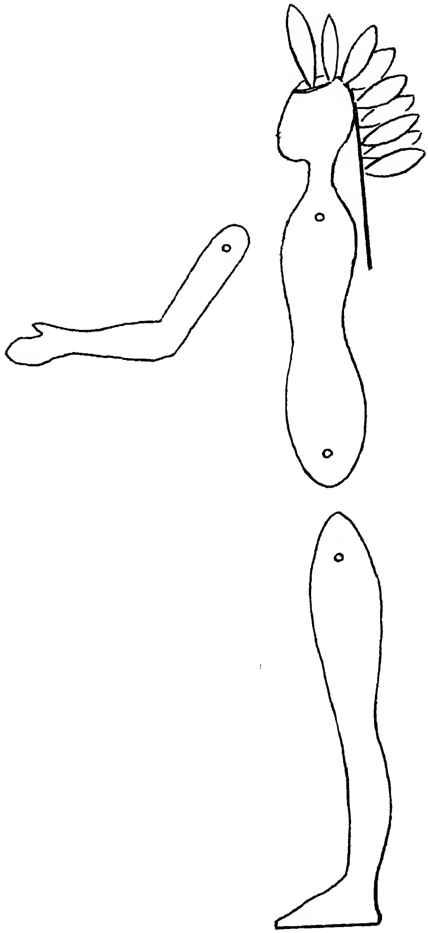


Fig. 30—Shadow Puppet Tracing of Individual Parts

Draw the figure in profile on scrap paper. Nine inches is a good size for adult figures. (Fig. 29.)

Trace each individual part on your cardboard and allow for the overlapping of the joints. (Fig. 30.)

Trunk fibre scraps can be bought by the pound. It makes good shadow figures.

Fig. 31—Brass Paper Fastener for Shadow Puppet

Cut out each part. Overlap the joints and punch holes through the joints.

Join the parts together with the brass type of paper fastener. (Fig. 31.) When fastening, be sure to allow enough leeway for loose movement at the joints. If brass fasteners cannot be obtained, join the parts with a needle and cord, making a loose knot at the end of the cord and, after joining, tie off the cord with another close-fitting knot, on the opposite side.

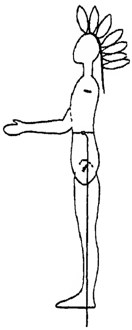


Fig. 32

The figure is now ready to be wired. (Fig. 32.) The main wire is attached rigidly to the figure by fastening around the waist line. The long end of the wire extending out from the back of the puppet is bent away at an angle, for convenience in handling.

Attach the second rod to the back of the hand. This is attached by first punching a hole in the hand and putting a brass fastener through so that the prongs will come on the back side of the puppet. Make a small loop at the end of your wire and slip it over the prongs, bending the prongs back. The hand wire should also be bent away from the figure. (Fig. 33.)

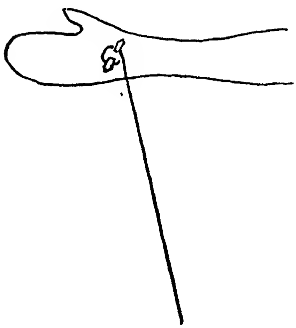
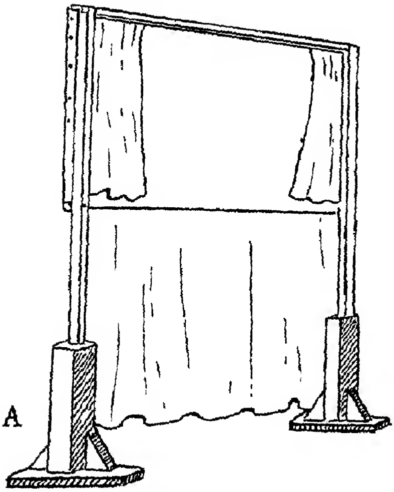


Fig. 33

Manipulation

Hold one control in each hand, pressing the figure against a screen. The screen is a framework approximately 36″ × 24″, over which a piece of thin material, such as white rayon, has been tightly stretched. (Figs.

34-A and B.) A light behind and above the puppeteer will throw the shadow of the puppet on the screen.



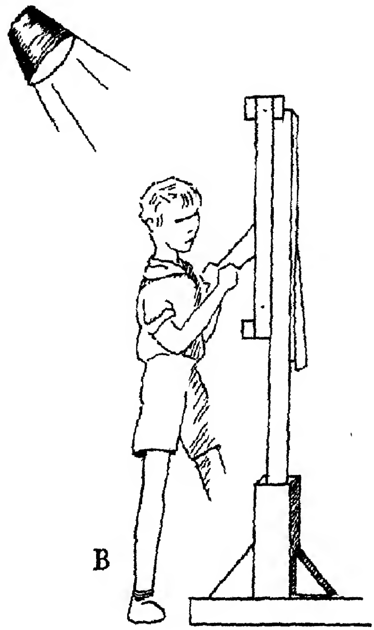


Fig. 34A—Shadow Puppet Screen Fig. 34B—Shadow Puppet Manipulation

Check your manipulation on the following points:

The outline of the puppet should be clear.

The puppet should be kept with its feet on the ground.

The upper part of the body and arm should move when the puppet is talking.

The hand and head of the manipulator should not be reflected on the screen.

PRODUCTION

Scenery

Scenery for hand puppets can be painted with water colours on brown wrapping paper. Add a little glue to keep the paint from flaking. Scenery can also be made on muslin or old sheets with designs appliquéd in scrap material. (Fig. 35.)

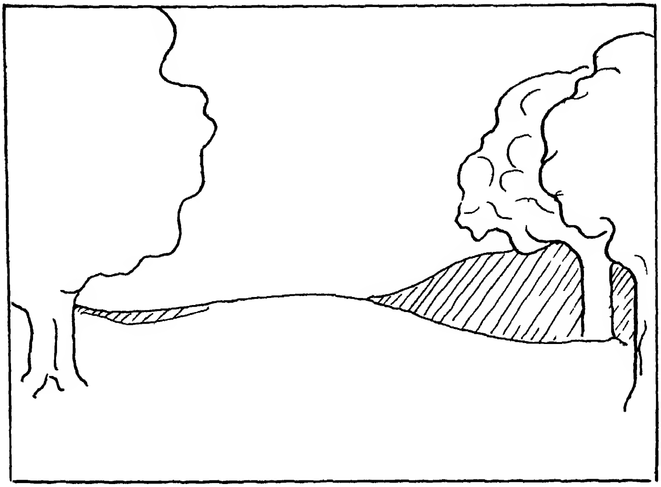


Fig. 35—Scenery for Puppet Production

Props

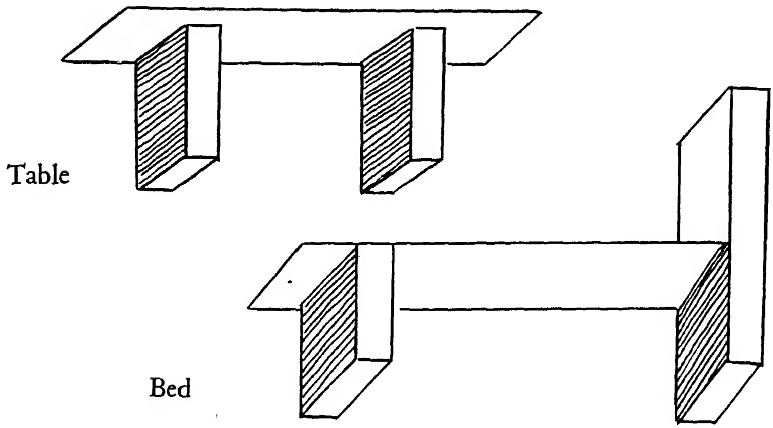


Fig. 36—Props for Puppet Production

Props can be easily made from scrap wood and bits of cardboard. For example, two blocks of wood with a sheet of cardboard across the top will make a bed, table or bench. Cardboard boxes of various sizes are also useful. (Fig. 36.)

Light

Bridge lamps, floor lamps and clip-on bed lamps can all be used for lighting your stage.

In a school auditorium, a projection machine throwing a spot of light from the back of the room on to the puppet stage will prove very effective. Crèpe paper can be used for colouring light but it should not be placed in contact with unprotected bulbs. Cellophane is better.

Check your hand puppet show during rehearsal for the following things:

Were the puppets held high enough to be seen at all times?

Did the puppets walk in from the side, instead of being popped up from the centre of the stage, and did they walk off the same way, so that they did not seem to be appearing and disappearing through the ground?

Did the puppets look at the character whom they were addressing, so that the audience could tell they were talking?

Were their heads and hands moving when they were talking and kept still at other times, so that the audience could tell who was talking?

Was the dialogue loud and clear, so that it could be heard and understood?

Were the voices in character? Characterisation in dialogue makes for interest.

Did the dialogue flow smoothly without any gaps? Gaps in the dialogue break the trend of attention, which is hard to re-establish.

Did the dialogue co-ordinate with the manipulation? Co-ordination makes it easier to tell who is talking.

Did the play start on time? Long waits make the audience restless.

Were the waits between scenes short?

Was there sufficient light on the stage for the puppets and scenery to be seen without straining?

If a curtain was used, did it work smoothly?

Stages

You can easily improvise a hand puppet stage at home or in the classroom by merely having two children hold up a piece of cloth to hide the puppeteers. Indoors you can tack the cloth across a doorway, just high enough to hide the head of the manipulator who stands in the door of the adjoining room. (Figs. 37 and 38.)

An apron makes an interesting stage. Let us pretend that we are doing a Dutch show. Our puppeteer, dressed in costume appropriate to the scene, works a puppet on each hand. She enters with a few Dutch dance steps, accompanied with music and keeping her puppets concealed behind her back. A few more bars of music, and two little boys in match-

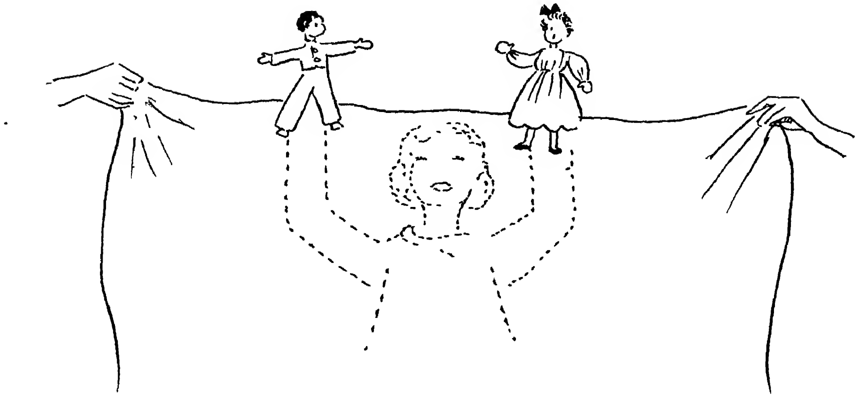


Fig. 37—Simple Puppet Stage

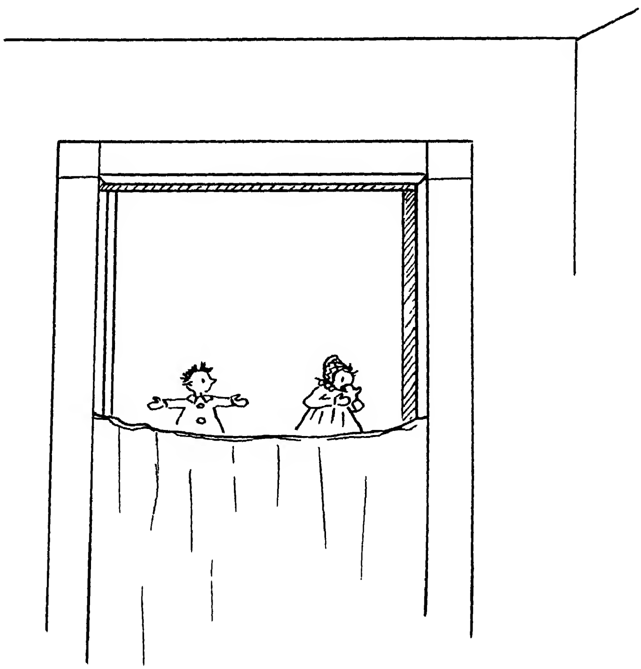


Fig. 38—Simple Puppet Stage Utilizing Cloth Across Doorway

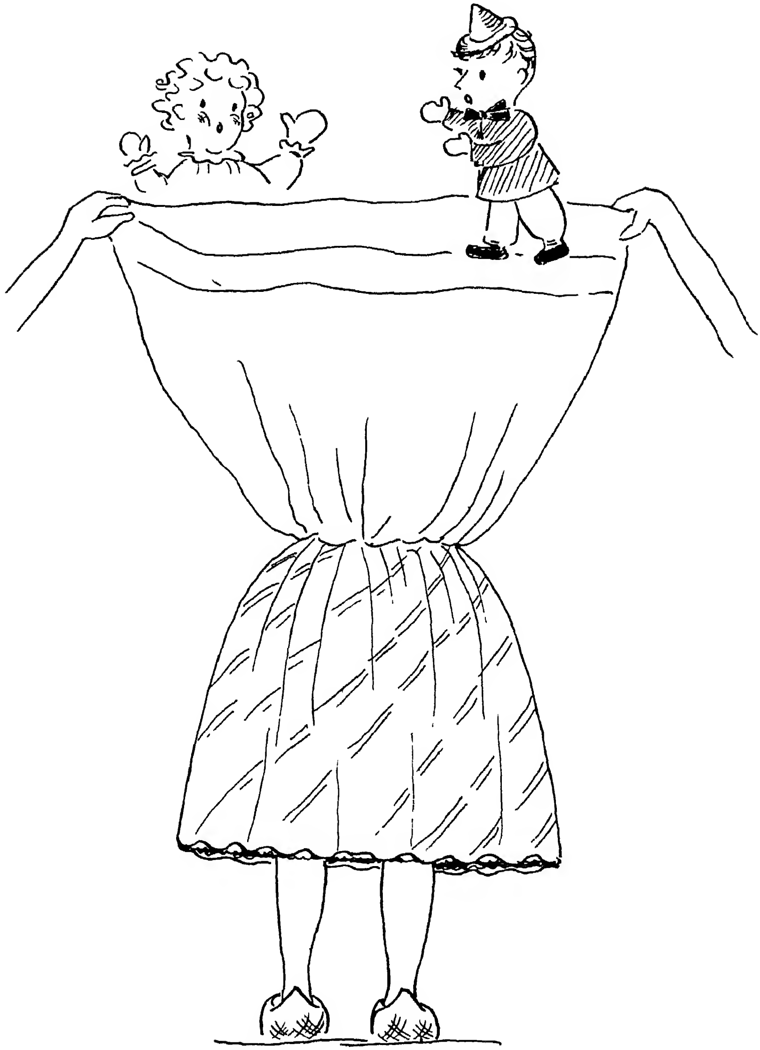


Fig. 39—Apron Stage

ing costume enter and take their places on either side of her. They pick up the hem of her apron and hold it up in front of her so that she can bring the puppets forward and use the edge of her apron as the stage. (Fig. 39.)

At the end of this chapter you will find working plans for a portable hand puppet stage which folds into a bundle about the size of a valise

and is easy to carry about. Place it on a piano or table when using. (Figs. 40 and 41.)

PLAY WRITING FOR PUPPETS

There are, unfortunately, very few good puppet plays available to the would-be producers. Many puppeteers, amateur as well as professional, prefer writing their own original plays, or adapting stories which they like and find suitable.

A simple story with plenty of action that appeals to the puppeteers is the best selection. Plays that depend upon dialogue for their chief interest are not good.

Be sure your story takes advantage of the type of puppet you are using —plenty of hand gestures, lots of business with the props for hand puppets, and dramatic scenery and light for shadow puppets.

Have a change of scene for every change of locale. Four scenes are about right for children.

Prepare a written action plot. Let us suppose that we have decided to do "Cinderella" with hand puppets and are ready to start our action plot. It would read something like this:

Cinderella

Characters:	
Cinderella	Beautiful, good, kind, sweet
Prince Charming	Handsome, generous, kind
Stepmother	Cruel, selfish
Stepsisters	Ugly, cruel
Fairy Godmother	Kind, gentle, sweet

Scenes

Kitchen—Ballroom of Palace—Kitchen

Scene I—Kitchen

Curtain opens, revealing Cinderella sweeping floor and weeping. Cinderella bemoans fact that every one is going to the Prince's ball but she.

ENTER Stepmother, who berates her for being so slow at the housework. EXITS.

ENTER Stepsisters, who demand that Cinderella help them dress for the ball.

Cinderella rushes from one to the other, while they shout at her and argue between themselves.

Stepsisters EXIT, taunting her with not being able to go to the ball.

Cinderella sits before the fireplace weeping bitterly.

ENTER Fairy Godmother. Asks why Cinderella is weeping. Cinderella explains.

In this way the consecutive action is noted down. During the first rehearsal with the puppets on the stage, the puppeteers, being familiar with the action, make up the dialogue.

The director sees that they maintain the continuity and helps the flow of dialogue with judicious questions: "What would you do, if you were Cinderella?" "What sort of voice do you think the mean stepsisters had?" etc. Good bits of dialogue are noted down, so that they will not be forgotten before the next rehearsal; ineffectual, undesirable dialogue is eliminated.

The advantages of not memorising dialogue are many. The puppeteer, especially if a child, does not become so absorbed in trying to recall the exact words, that he forgets to manipulate the puppet. He will speak fluently and with expression because the words he is using are his own. If emergencies arise and substitutions or changes have to be made in the cast, it will not throw every one off.

However, if you are giving a show for a special occasion, and wish to have a finished performance, have the dialogue written out and memorised as for a regular dramatic performance, and have thorough rehearsals, with strict attention to dramatic business, dialogue, and timing.

PORTABLE HAND PUPPET STAGE (Fig. 40).

Materials

Wood—36½″ of 1½″ × 1½″ pine cut into.
8 lengths of 24″
6 lengths of 26″
2 lengths of 7½″
2 lengths of 24½″
2 lengths of 20″

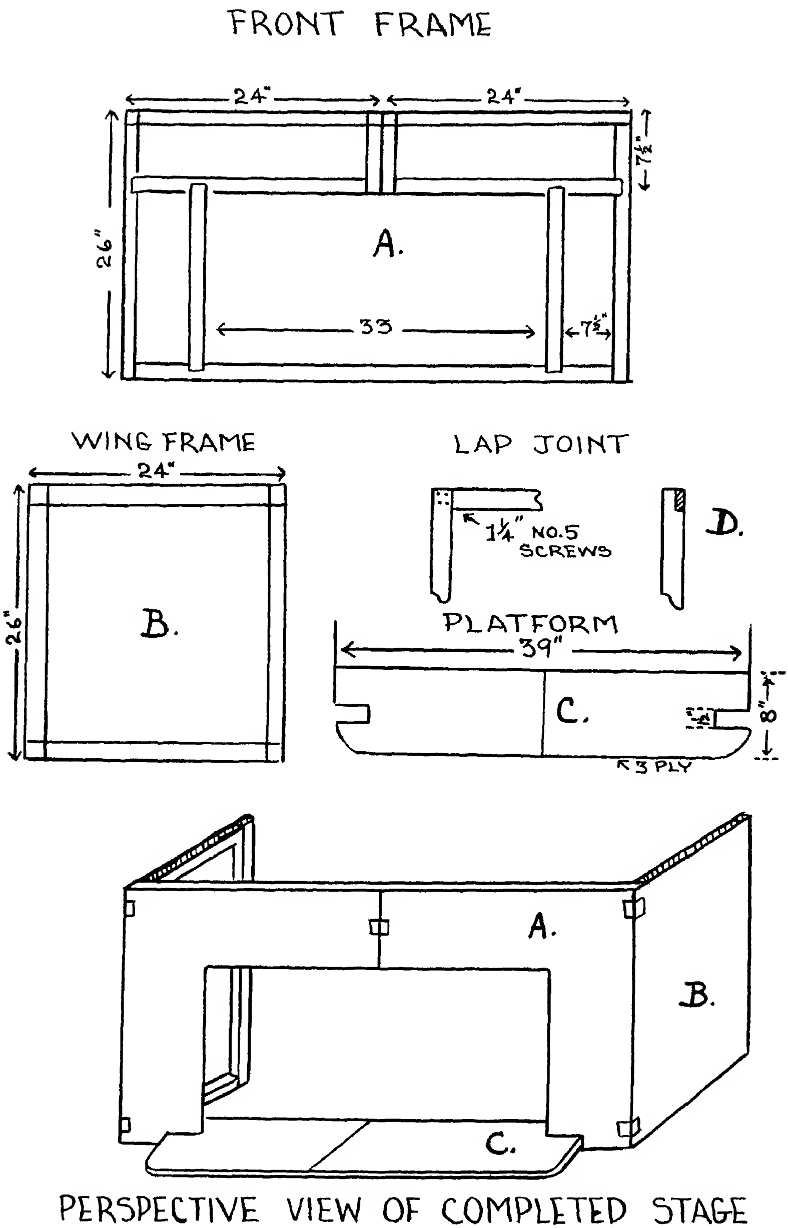


Fig. 40—Portable Hand Puppet Stage

Three-ply, size 39″ × 8″ cut into 2 pieces, 19½″ × 8″
½ gross #5—1¼″ wood screws
6—2½″ hinges
1—1″ hinge
2—1½″ pin hinges
¼ pound #2 tacks
3 yards unbleached muslin, 36″ wide
Whiting, glue, and paint

Instructions

Cut wood to the sizes shown in drawings A, B and C. Put frames together with the lap-joint illustrated. (D.) Stretch the muslin over the frames and tack down on the inside. Size these flats with a mixture of glue, whiting and water. Hinge the flats together as shown in the perspective drawing. Cut 3-ply for platform and hinge. Paint with water colour mixed with size.

Hints

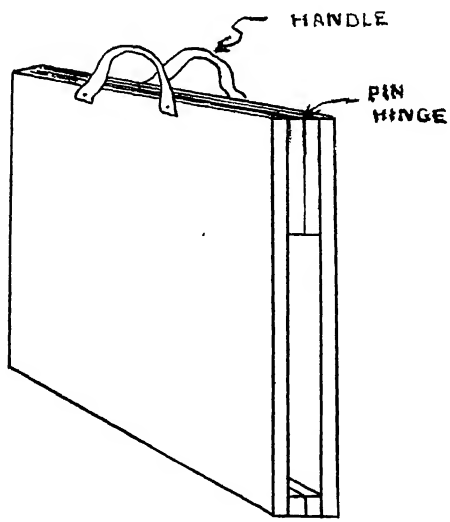


Fig. 41—Carrying Case for Portable Hand Paper Stage

If it is desirable to carry this stage around, the addition of two pin-hinges and a handle makes it much more convenient (Fig. 41.)

This stage can be used on a table if two short legs are bolted on to the ends of the wings; otherwise it is advisable to place it in a higher position, such as on the top of a piano, etc.

In some cases it may be better to cover the flats with black duvetyn instead of painting them. Duvetyn can be cleaned easily by brushing.

Bibliography

GENERAL

Bowles, Ella Shannon, *Homespun Handicrafts,* Philadelphia: J. B. Lippincott Co., 1931.

Dodds, Robert Elihu, *Handicrafts As a Hobby,* New York: Harper Bros., 1939.

Eaton, Allen Hendershott, *Handicrafts of the Southern Highlands,* (suggestions for the wider use of handicrafts in adult education and in recreation). New York: Russell Sage Foundation, 1937.

Griswold, Lester, *Handicrafts,* (simplified procedure and projects), Colorado Springs. Author, 1942.

Hutchins, Mabel Reagh, *Creative Handicrafts,* New York: Leisure League of America, 1938.

Newkirk, Louis V., *Integrated Handwork for Elementary Schools,* New York: Silver, Burdett Co., 1940.

Parkhill, Martha, and Spaeth, Dorothy, *It's Fun To Make Things,* New York: A. S. Barnes and Co., 1941.

Payant, Felix, *Create Something,* (A Handbook for Beginners), Columbus, Ohio: Design Publishing Co., 1939.

Perry, Evalina Kraus, *Crafts for Fun,* New York: William Morrow and Co., 1940.

Reynolds, Harry Atwood, *Low Cost Crafts for Everyone,* New York: Greenberg Publisher, Inc., 1939.

Stieri, Emanuele, *Book of Indoor Hobbies,* New York: Whittlesey House, 1938.

HISTORY

Williamson, Scott Graham, *The American Craftsman,* New York: Crown Publishers, 1940.

Wright, Richardson, *Hawkers and Walkers in Early America,* Philadelphia: J. B. Lippincott Co., 1927.

DESIGN AND COLOUR

ASPRAY, MURIEL, *A Book of Design for Craftwork,* London: A. & C. Black, 1930.

BEST-MAUGARD, ADOLFO, *Draw Animals,* New York: Alfred A. Knopf, Inc., 1931.

——, *Method for Creative Design,* New York: Alfred A. Knopf, Inc., 1935.

BURRIS-MEYER, ELIZABETH, *Color and Design in the Creative Arts,* New York: Prentice-Hall, Inc.

CLEGG, SAMUEL, *Drawing and Design (A School Course in Composition),* London: Sir Isaac Pitman, and Sons, Ltd.

Design Magazine, Columbus, Ohio: Design Publishing Co.

GRAVES, MAITLAND E., *The Art of Color and Design,* New York: McGraw-Hill Book Co., 1941.

MINTER, DAVIDE C., ED., *Modern Home Crafts,* New York: John H. Hopkins and Son, 1936.

NORLING, ERNEST R., *Perspective Made Easy,* New York: The Macmillan Co., 1939.

SARGENT, WALTER, *Enjoyment and Use of Color,* New York: Charles Scribner's Sons, 1923.

REISS, WINOLD, and SCHWEIZER, ALBERT CHARLES, *You Can Design,* New York: McGraw-Hill Book Co., 1939.

PAPERCRAFT

BUXTON, G. F., and CURRAN, FREDL, *Paper and Cardboard Construction,* Peoria: Manual Arts Press, 1911-13.

LEEMING, JOSEPH, *Fun with Paper,* New York: Frederick A. Stokes Co.

Modeling in Paper, New York: Industrial Arts Cooperative Service.

Recipe for Paper Making, New York: Industrial Arts Cooperative Service.

Paper Decoration, New York: Industrial Arts Cooperative Service.

ROSEMAN, I. F., *Colored Paper Work,* Peoria: Manual Arts Press, 1930.

PRINTING FROM BLOCKS

BONE, CHARLOTTE D., *Linoleum Block Printing,* Boston: Beacon Press Inc.

CORGIN, T. J., *Handbook Printing on Fabrics,* London: Sir Isaac Pitman, and Sons, Ltd.

DOBSON, MARGARET, *Block Cutting and Print Making By Hand,* London: Sir Isaac Pitman, and Sons, Ltd.

FLETCHER, F. MORLEY, *Wood Block Printing,* London: Sir Isaac Pitman, and Sons, Ltd.

LITTLEJOHNS, IDELIA BLANCHE, *Prints and Patterns,* London: Sir Isaac Pitman, and Sons, Ltd.

POLK, RALPH W., *Essentials of Linoleum Block Printing,* Peoria: Manual Arts Press, 1927.

RICE, WILLIAM S., *Block Prints: How To Make Them,* Milwaukee: Bruce Publishing Co., 1941.

YEATON, LYLE B., *Linoleum Block Printing for the Amateur,* New York: Yeaton Press, 1932.

SILK SCREEN PRINTING

BARRY, JOHN J., *How to Make Etchings,* 3rd Ed., Pelham, New York: Bridgman Publishers, 1937.

BIEGELEISEN, J. I., *Silk Screen Stencil Craft as a Hobby,* New York: Harper Bros., 1929.

———, *Silk Screen Technique,* New York: Creative Crafts Press.

HAND PRINTING PRESS

HENRY, FRANK SOUDER, *Essentials of Printing,* (A Textbook for Beginners), New York: John Wiley and Sons, Inc., 1924.

JACKSON, HARTLEY EVERETT, *Twenty Lead Soldiers,* (A Textbook of Printing Types, Methods and Processes.), California: Stanford University Press, 1937.

McMURTRIE, D. C., *The Book: The Story of Printing and Book Making,* New York: Covici-Friede, 1937.

SHOEN, HARRIET H., *Let's Make A Book,* New York: The Macmillan Co., 1934.

BOOK BINDING

BEAN, FLORENCE ORDWAY, and BRODHEAD, J. C., *Bookbinding for Beginners,* Worcester, Mass.: Davis Press, 1924.

DAVENPORT, C. J. B., *The Book: Its History and Development,* New York. Peter Smith, 1930.

Forsyth, E. Marjorie, *Bookbinding for Teachers, Students and Amateurs,* London: A. and C. Black, 1932.

Grimm, Francis W., *Primer in Bookbinding,* Boston: Houghton Mifflin Co., 1939.

Halliday, J., *Bookbinding as a Handwork Subject,* (A Full Explanation of How Books Can Be Bound with Simple Apparatus in a School Classroom). London: Sir Isaac Pitman and Sons, Ltd., 1933.

Hewitt-Bates, J. S., *Bookbinding for Schools,* (A Textbook for Teachers and Students in Elementary Schools and Training Colleges.) Peoria: Manual Arts Press, 1935.

Perry, Kenneth F., and Raab, Clarence T., *The Binding of Books,* Peoria: Manual Arts Press, 1940.

Pratt, Guy A., *Let's Bind A Book,* Milwaukee: Bruce Publishing Co., 1940.

WEAVING

Atwater, Mary M., *Shuttle-Craft Book of American Hand Weaving,* New York: The Macmillan Co., 1937.

Baity, Elizabeth Cheeley, *Man Is a Weaver,* New York: Viking Press, Inc., 1942.

Coates, Helen, *Weaving for Amateurs,* London and New York: Studio Publications, Inc.

Dobbs, Ella Victoria, *First Steps in Weaving,* New York: The Macmillan Co., 1938.

Kean, Frieda, *Art Weaving,* Boston: D. C. Heath and Co., 1937.

Simpson, L. E., and Weir, M., *The Weaver's Craft,* Peoria: Manual Arts Press, 1936.

LEATHERCRAFT

Bang, Eleonore E., *Leather Craft for Amateurs,* Boston: Beacon Press, Inc. 1935.

Cramlet, Ross C., *Essentials of Leather Craft,* Milwaukee: Bruce Publishing Co., 1939.

Pyle, Clifford, *Leather Craft As a Hobby,* New York: Harper Bros., 1940.

WORKING IN WOOD

Champion, Paul V., *Creative Crate Craft,* Milwaukee: Bruce Publishing Co., 1942.

DeVette, William A., *100 Problems in Woodwork,* Milwaukee: Bruce Publishing Co., 1927

Faulkner, Herbert V., *Wood Carving As a Hobby,* New York: Harper and Bros., 1934.

Faurot, Walter L., *The Art of Whittling,* Peoria: Manual Arts Press, 1939.

Griffiths, I. S., *Essentials of Woodworking,* Peoria: Manual Arts Press, 1931.

Jack, George, *Wood Carving: Designs and Workmanship,* Milwaukee: Bruce Publishing Co.

Jeffrey, Harry B., *Wood Finishing,* Peoria: Manual Arts Press, 1925.

Moore, Harris W., *Chip Carving,* Peoria: Manual Arts Press, 1922.

Rjorth, Herman, *Principles of Woodworking,* Milwaukee: Bruce Publishing Co., 1930.

Stieri, Emanuele, *Woodworking As a Hobby,* New York: Harper and Bros., 1939.

Tangerman, E. J., *Whittling and Woodcarving,* New York: Whittlesey House, 1939.

METALRY

Hamilton, Edwin Timothy, *Tin Can Craft,* New York: Dodd, Mead and Co., 1935.

Howard, J. H., *The Working of Semi-Precious Stones,* Rocks and Minerals Press, 1931.

Kronquist, Emil F., *Art Metalwork,* New York: Whittlesey House, 1942.

———, *Metalcraft and Jewelry,* Peoria: Manual Arts Press, 1926.

Kinz, George Frederick, *The Curious Lore of Precious Stones,* Halcyon Press, 1936.

Manzoni, Peter, *Metalcraft for Amateurs,* Boston: Beacon Press, 1935.

Pack, Greta, *Jewelry and Enameling,* New York: D. VanNostrand Co., 1941.

Rathbone, L. B., *Unit Jewelry,* London: Constable and Co., 1921.

Wodiska, Julius, *A Book of Precious Stones,* New York: G. P. Putnam's Sons, 1909.

There are also many catalogues of tools, equipment, and materials. Catalogues, in addition to giving the prices of various items, illustrate much equipment and many tools, enabling the beginner to understand and identify them. If the tools are new, there is often a brief description of their uses.

Frequently catalogues devote a few pages to valuable tables of weights and measures and other data useful to the hobbyist

POTTERY CRAFT

BINNS, CHARLES F., *The Potter's Craft,* New York: D. VanNostrand Co., 1922.

COX, GEORGE JAMES, *Pottery for Artists, Craftsmen, and Teachers,* New York: The Macmillan Co., 1936.

DOUGHERTY, JOHN WOLFE, *Pottery Made Easy,* Milwaukee. Bruce Publishing Co., 1934.

JENKINS, R. HORACE, *Practical Pottery for Craftsmen and Students,* Milwaukee: Bruce Publishing Co., 1942.

PUPPETRY

FICKLER, BESSIE ALEXANDER, *Handbook of Fist Puppets,* New York: Frederick A. Stokes Co., 1935.

HOBEN, ALICE M., *The Beginner's Puppet Book,* New York, Noble and Noble, 1938.

LANCHESTER, WALDO S., and TOMLINSON, R. R., *Hand Puppets and String Puppets,* Peoria: Manual Arts Press, 1937.

MILK, WINIFRED H., and DUNN, LOUISE M., *Shadow Plays and How to Produce Them,* New York: Doubleday, Doran and Co., 1938.

MILLIGAN, DAVID F., *Fist Puppetry,* New York: A. S. Barnes and Co., 1938.

Index

Chapter I—Starting a Craft Program

Chapter II—A Word About Design and Colour

Chapter III—Papercraft

Chapter IV—Printing from Blocks

Chapter V—The Silk Screen Printing Process

Chapter VI—A Hand Printing Press

Chapter VII—Bookbinding

Chapter VIII—An Introduction to Weaving

Chapter IX—Leathercraft

Chapter X—Working in Wood

Chapter XI—Metal Work for Beginners

Chapter XII—An Introduction to Pottery

Chapter XIII—Puppetry for Everybody